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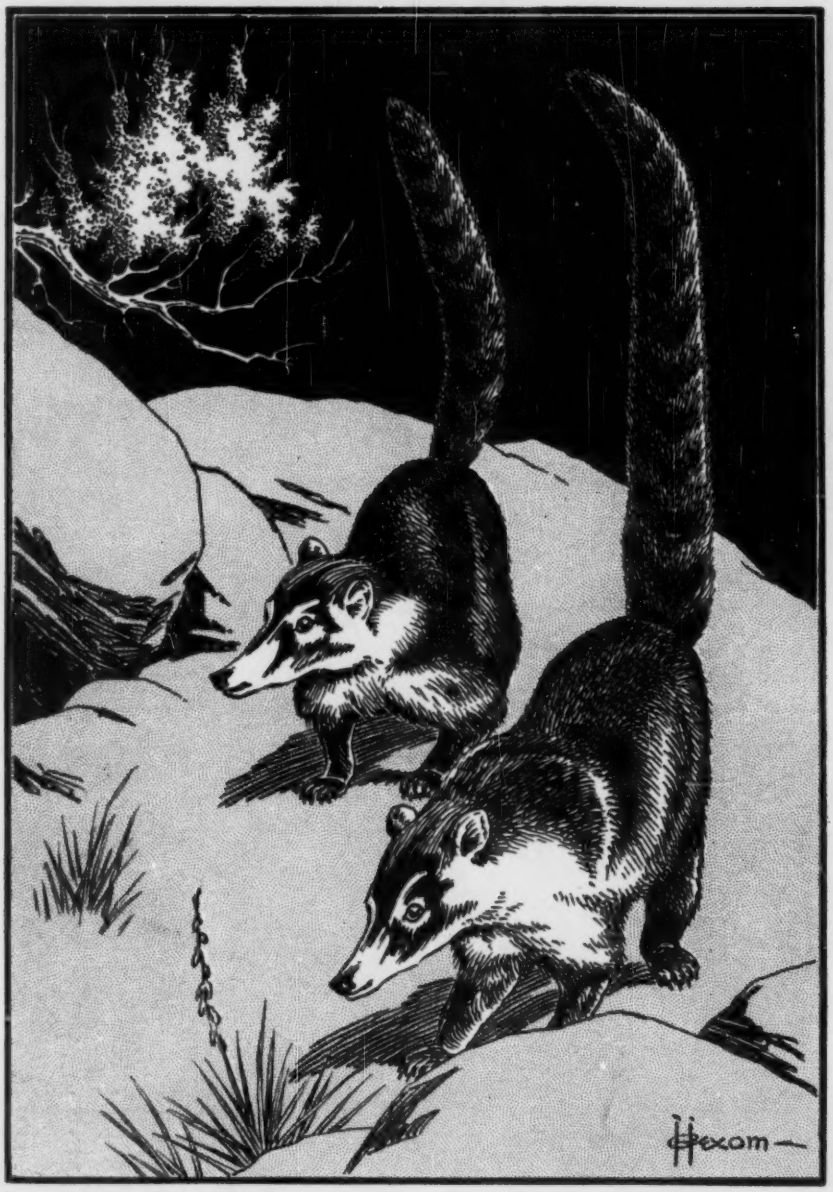

OCTOBER
1958

VOLUME 51
NUMBER 8

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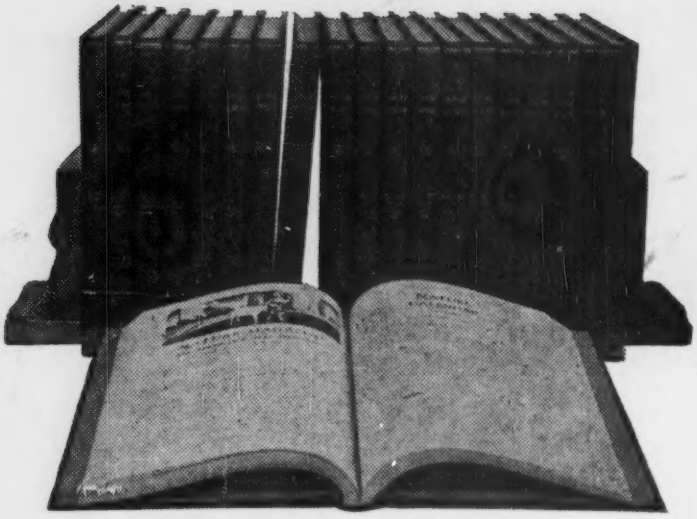

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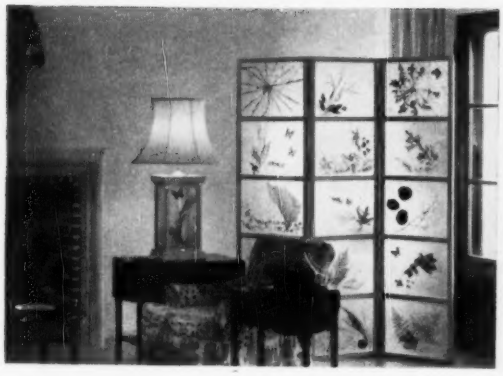
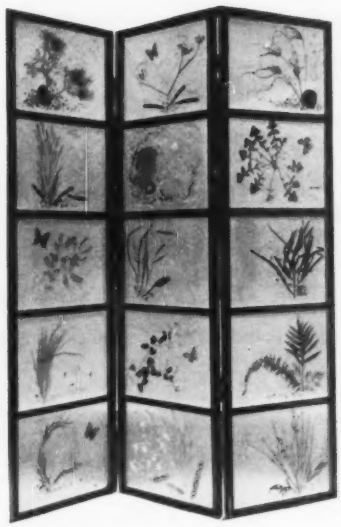
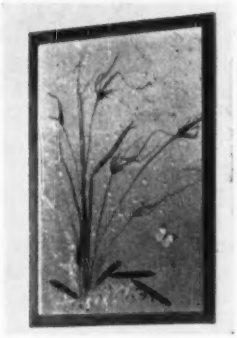
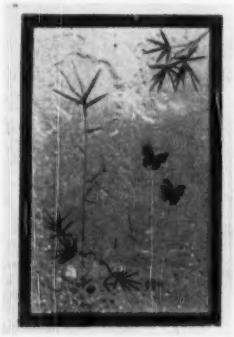




Nancy Hutchings CREATES NATURE PANELS

. . . a new horizon in craftwork





This fine Bermuda artist is widely known for her lovely and highly original glass panel designs. She works with materials indigenous to the island . . . . . Bay grapes, ferns, thistles, bamboo, sea fans, shells, star fish, sea horses butterflies and many others.

Each of the panels is a completely original design. These she blends with rare sensitivity into a strikingly beautiful overall design. No two are ever alike. Examples of her work shown here add a graceful note to homes and offices and fine hotels in Bermuda, New York and Connecticut. Does it take great skill and experience to work with the liquid bonding materials? Not at all. The laminating technique itself is so amazingly simple that anybody can do it. Neither heat nor pressure are required, nor is any equipment needed except a pair of scissors and a set of measuring spoons. A hardening agent is mixed with the liquid plastic which is then applied to glass or used to impregnate fiberglass fabric of various types. It sets hard within 30 to 60 minutes at room temperature. Basically, that is all there is to it . . . except for the design. Your imagination and creative craftsmanship enable you to make your own screens or room dividers, door panels, lamp bases and table decorations, individually made to reflect your taste and personality, to blend harmoniously into your own decorative schemes. Wherever you live, you will find an abundance of materials that are native to your region and that will lend themselves beautifully to this work. We'll be delighted to tell you more about the artist and her work. Nancy Hutchings is perfectly willing to share with you the knowledge and skill she has learned from first hand experience. Address your request to DEPT. L-91, The Castolite Co., Woodstock, Illinois. Please enclose 25c to cover mailing and handling charges.

Next month we have the pleasure of featuring Dorothy Thorne's handcrafted table accessories. You'll love her honest designs and her easy way of demonstrating the simple principles of the fascinating craft.

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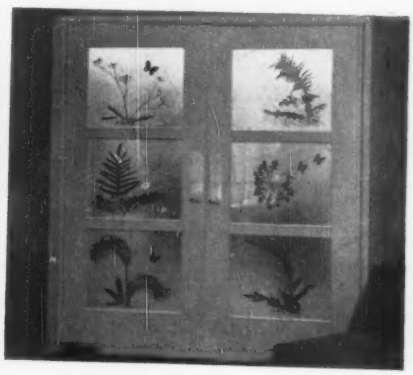

Nature Magazine

OCTOBER, 1958 VOL. 51 NO. 8

Published by the AMERICAN NATURE ASSOCIATION to stimulate public interest in every phase of nature and the out-of-doors, and devoted to the practical conservation of the great natural resources of America.

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Nature Magazine, past and present, is indexed in The Reader's Guide in your public library.

Reviews

Strange Plants and Their Ways

By Ross E. Hutchins. Chicago. 1958. Rand McNally and Company. 96 pages. Illustrated. $2.95.

The author of this interesting book is an entomologist and author of *Insect Hunters and Trappers*. He is, also, an active naturalist. He discusses in popular terms in this latest book the wonder world of plants, how plants live and the work that flowers perform. Other chapters are devoted to strange plant partnerships, seed gypsies, plant cannibals, and to the mistletoe, dodder and lichens, among other subjects.

Listening in the Dark

By Donald R. Griffin. New Haven, Connecticut. 1958. Yale University Press. 413 pages. Illustrated. $7.50.

As a boy Donald Griffin began studying the navigation of birds and bats, especially the latter. His work with bats and his research into their acoustical orientation has been unique, and he is a world authority on these flying mammals. This work led into allied areas involving animal hearing, and resulted in material that formed the basis of a series of Trumbull Lectures at Yale University. This fascinating book is based upon these lectures. The first nine chapters are devoted to bats, the remaining chapters treating with acoustic orientation and echolocation of a variety of creatures, from whales to whirligig beetles, and including nocturnal birds. These excursions lead to human echolocation, especially with the blind, and the book concludes with a most interesting chapter entitled "The Experimental Naturalist in Modern Science." Professor of Zoology at Harvard University, Dr. Griffin is the author of many scientific and popular articles, but this is his first book, and a notable one.

Briefly Noted

Dig for Pirate Treasure. By Robert I. Nesmith. New York. 1958. Devin-Adair Co. 302 pages. $6.00.

There is still buried treasure, this author contends, in a discussion of this subject.

The Story of Archaeology. By Agnes Allen. New York. 1958. Philosophical Library. 245 pages. Illustrated. $4.75.

Popular discussion of the discoveries of the archeologist.

Sea Shells of Tropical West America

By A. Myra Keen. Marine Mollusks from Lower California to Colombia. Designed for the serious amateur collector, contains descriptions of 1,650 species, with over 1,500 illustrations. 10 color pages. $12.50

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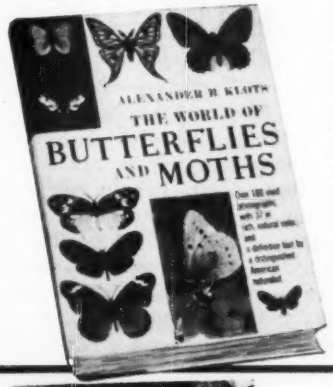

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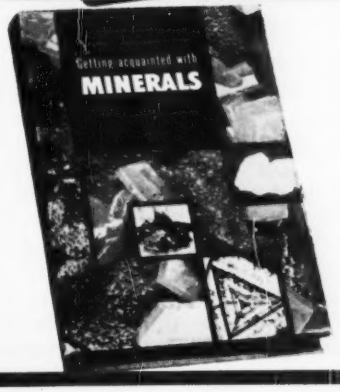

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Nature IN PRINT

Due to a heavy schedule of conservation commitments on the West Coast during the past month, it has proved impossible for Howard Zahniser to prepare his regular book page for October's *Nature Magazine*. In our next issue we hope to have Mr. Zahniser back on his customary pages.

Ed.

Gardening, Forcing Conditioning and Drying for Flower Arrangements

By Arno and Irene Nehrling. New York. 1958. Hearthside Press. 228 pages. Illustrated. $3.95.

According to the publishers this is the only book that is devoted to planting for year-round flower arrangements. So far as we know this is a justified claim and certainly this book appears to supply about everything that the flower arranger demands. It is based on long and practical experience and the text is such that anyone interested in this specialized plant field should be able to use its advice effectively.

Clear Lands and Icy Seas

By Theodora C. Stanwell-Fletcher. New York. Dodd, Mead & Co. 1958. 264 pages. Illustrated. $4.00.

The story of a voyage on one of the Hudson Bay Company's supply ships, from Montreal up the east coast of Labrador to Hudson Straits and down Hudson Bay to Churchill. The author is fascinated by the scenery and inhabitants of the far north, and succeeds in imparting—in principle, at least—some of her enthusiasm to the reader.

Landscapes of Alaska

Edited by Howel Williams. Berkeley 4, California. 1958. University of California Press. 148 pages. Illustrated and with inset maps. $5.00.

With Alaska now our 49th State, this book has special interest. It treats with the geologic evolution and the present status of the landscapes of Alaska. It has been prepared by members of the United States Geological Survey, and is published in cooperation with the National Park Service of the Department of the Interior. Splendid pictures illuminate a text that is written for the average reader.

The Travels of William Bartram

Edited by Francis Harper. New Haven, Connecticut. 1958. Yale University Press. 727 pages, with plates and maps. $8.50.

Few would have the opportunity, or the ability, to follow the travels of William Bartram with the understanding and attention to detail that Francis Harper possesses. Mr. Harper is Research Associate of the John Bartram Association of Philadelphia and a lifelong student of the Bartrams. This splendid and valuable volume had its origin in the enthusiasm of the late Arthur N. Leeds who, with the author, evolved plans for annotated editions of the works of both John and William Bartram. Fate left it for Mr. Harper to carry through this project, and after careful retracing of William Bartram's routes of travel, he now gives us an annotated story of these travels that makes these pioneer explorations of special significance and fascination. This is a Naturalist's Edition and of outstanding interest to the naturalist, professional or amateur. However, it should be equally alluring to any intelligent reader interested in wild America of the days of the Bartrams.

Wild Folk in the Mountains

By Carroll Lane Fenton. New York. 1958. The John Day Company. 96 pages. Illustrated by the Author. $3.00.

In this popular introduction to the creatures that live in our western mountains, Dr. Fenton brings his customary talents to deal with an interesting animal region. The aim is for the younger readers, up to the age of twelve. Dr. Fenton has a faculty for writing for and not down to such an audience and without the anthropomorphism so often regarded as necessary for the younger audience.

The Naturalists' Directory

Compiled by M. E. Cassino. Boxford, Mass. 1958. Published by the compiler. $5.00.

This is the thirty-eighth edition of this directory, the first having been published in 1878. It lists by States, Canadian Province or foreign country the names and interests of naturalists and collectors. It includes lists of periodicals in the natural history field and natural history museums.

Pocket Guide to Trees

By William C. Grimm. Harrisburg, Pa. 1958. The Stackpole Company. 144 pages. Illustrated. Paper-bound, $1.50.

This is a primarily pictorial guide to the trees. The illustrations show the chief identifying details of leaf, fruit and buds, and should be a handy book to have along on any outdoor trip.

Briefly Noted

Sea Mist and Balsam. By Rosemary Clifford Trott. Mill Valley, California. 1958. The Wings Press. 50 pages. $2.50.

Echoes of her deep love of all things of Nature, the harsh as well as the beautiful, are heard in this fine book of poems, each written with simplicity, feeling and competence.

The Brown Thrush Sings. By Russell Pettis Askue. Mill Valley, California. 1958. The Wings Press. 56 pages. $2.00.

In this small book of poems, whose author is both poet and painter, grownups and children alike will find delightful bits of Nature presented to fit any mood, whether grave or gay. R.B.

Concise Dictionary of Holidays. By Raymond Jahn. New York. 1958. Philosophical Library. 102 pages. $5.00.

Interesting compilation about many holidays, many of them obscure.

Flower Chronicles. By Buckner Hollingsworth. New Brunswick, N. J. 1958. Rutgers University Press. 302 pages. $5.00.

The story of flowers and men of the past.

Statistics on Outdoor Recreation. By Marion Clawson. Washington, D. C. 1958. Resources for the Future. 165 pages. $2.00.

Imposing compilation of statistical data on outdoor recreation of all sorts.

Let's Go to a Farm. By Laura Sootin. New York. 1958. G. P. Putnam's Sons. 48 pages. Illustrated by Marvin Zetlan. $1.95.

For the quite young reader and about animals of the farm.

Forest Farmer. Edited by J. Walter Myers, Jr. Atlanta, Ga. 1958. Forest Farmers Association Cooperative. 176 pages. $4.00.

A guidebook for southern timberland owners.

Grants Available

A number of scholarships and fellowships are available to qualified individuals working in the field of conservation or conservation education, through the recently announced 1959-1960 scholarship and fellowship program of the National Wildlife Federation. Qualifying classifications are not inflexible, and an applicant need not necessarily be enrolled in an institution of higher learning to qualify for grants of up to $1000; but a project or proposal should be intended primarily to further the cause of conservation. Completed applications must be postmarked on or before November 1 of this year, and interested persons may request further information and application blanks from the executive director, National Wildlife Federation, 232 Carroll Street N. W., Washington 12, D. C.

Air Pollution Conference

In extending an invitation to the National Conference on Air Pollution, to be held at the Sheraton-Park Hotel in Washington, D. C., November 18 to 20, the U. S. Department of Health, Education and Welfare points out to representatives of government, industry and voluntary organizations that the world's "ocean of air" is far from being limitless, and that air pollution is becoming an increasingly serious problem. The prime purpose of the conference will be the assessment of work already done toward solving the problem, and the development of a coordinated plan of future action.

Secretary Appointed

Sigurd Olson, president of the National Parks Association of Washington, D. C., has announced the appointment of Anthony Wayne Smith as executive secretary of the Association. Mr. Smith is a Washington attorney and nationally prominent conservation enthusiast.

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By Aylesa Forsee

Illustrated by Winifred Lubell

Louis Agassiz was born in 1807, son of the Protestant pastor of a small Swiss town. By the time he was fifteen years old his heart and mind were fixed on a career as naturalist and writer, but the family income was too limited to provide the necessary training. The unflagging ardor and firmness of purpose with which he surmounted this difficulty was to bring him to brilliant success not only in fulfilling his original ambition, but in becoming as well physician, geologist, lecturer, museum curator, and—perhaps most important—teacher. $4.00

SATELLITE OF THE SUN

By Athelstan Spilhaus

Illustrated with Photographs

This introduction to the physics of the earth, by the Dean of the Institute of Technology at the University of Minnesota, deals with "the bulk of the earth, from the rocky substance on the surface right down to the hot liquid metal center," with the water on our planet's surface, and the atmosphere beyond. It includes such subjects as meteors and meteorites; airglow; cosmic rays; the earth's origin, size, and shape; the landscape at the bottom of the ocean; how the two ends of the earth differ; and why the poles are important. $3.50

AN ADVENTURE IN ASTRONOMY

By Kenneth Heuer

Illustrated with Photographs

Written by a former lecturer in astronomy at the American Museum—Hayden Planetarium, this book describes the heavens as they appear from strategic places around the world—New York City; Helsinki, Finland; Longyear City, West Spitsbergen; the North Pole; the South Pole; Wellington, New Zealand; and Quito, Ecuador. Constellations unfamiliar to us—Crux, the Southern Cross, for example, and Musca the Fly—are clearly defined, and excellent photographs supplement the accounts of such wonders as the zodiacal light, the aurora borealis, and the midnight sun. $3.50

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OUR OCTOBER AUTHORS

Anne Bowes

Edwin Way Teale

Summer months find Anne LaBastille Bowes and her husband operating their hotel on a lake in the central Adirondacks, while during the winter the couple conducts expeditions for small groups of naturalists into the less frequented islands of the Caribbean and the Florida Everglades. Mrs. Bowes, free-lance writer and photographer, was formerly a wildlife tour leader for the National Audubon Society, assistant at the marine laboratory of the University of Miami, and a teacher at Woods Hole School of Science, in Massachusetts. . .George S. Fichter, of Fort Meyers, Florida, is a writer on conservation and wildlife subjects. . .Muriel L. Guberlet, English teacher at the University of Washington, has written four books and many articles on her specialty, the life of the seashore; she lives in Seattle. . .Edwin Way Teale needs little in the way of introduction to most readers of *Nature Magazine;* naturalist, expert photographer, and prolific writer of books and articles on the out-of-doors, Mr. Teale makes his home at Baldwin, Long Island. . .C. Haven Kolb, Jr., is a biology teacher at Dundalk High School in Baltimore County, Maryland . . .William H. Amos is chairman of the science department at St. Andrew's School at Middletown, Delaware, a research associate at the University of Delaware marine laboratories at Lewes, and editor of the University's *Estuarine Bulletin*. . .Barbara B. Paine is an amateur naturalist and free-lance writer of Cambridge, Massachusetts. . .Rosemary Clarke, of DeLand, Florida, is a well-known concert pianist and an enthusiastic conchologist and malacologist, possessor of one of the largest private seashell collections in the country. . . Anna Tillenius, graduate of the University of Manitoba and contributor to Canadian and Australian—and now American—magazines, lives with her artist husband, Clarence, and son Homer, at Winnipeg.

Reviews

Timber Resources for America's Future

U.S. Forest Service. Washington, D.C. 1958. Superintendent of Documents, U.S. Government Printing Office. 713 pages. $7.00.

This is the most comprehensive appraisal of the timber situation in the United States and a most important reference volume. It has been brought within covers by the staff of the U. S. Forest Service in collaboration with State Foresters, other State agencies, forest industries, and public and private organizations. In a foreword Dr. Richard E. McArdle, Chief of the Service, points out that this report indicates that "the United States is not faced with an acute timber shortage," and adds that "it is equally clear that there is little danger of timber becoming a surplus crop." He asserts that there is no ground for complacency and states: "What we do in the next 10 or 20 years will determine whether we shall grow enough timber to enable our children and their children to enjoy the timber abundance that we ourselves know." In the light of this statement this volume is an important one, indeed, and the monumental task that the Forest Service has done in compiling it should be roundly applauded.

The Mushroom Hunter's Field Guide

By Alexander H. Smith. Ann Arbor, Michigan. 1958. University of Michigan Press. 197 pages. Illustrated. $4.95.

This is truly a field guide to mushroom identification for the layman or outdoors person. As the author points out, the illustrations are the backbone of the book. These are supplemented by informal discussion of the species, with emphasis on the field characters. More than 120 species of edible and poisonous mushrooms are included, and the emphasis is on the Great Lakes region, the western United States and the Northeast.

101 Wildflowers of Shenandoah National Park

By Grant and Wenonah Sharpe, Seattle, Wash. 1958. University of Washington Press. 40 pages. Illustrated. $1.00

The profusion of wildflowers in Shenandoah National Park can be quite vexing to the "week-end" botanist, but at least 101 of them need cause no further trouble, thanks to this little paper-covered volume and its accurate drawings and easy-to-read descriptive panels. Does not pretend to cover all wildflowers of this prolific region, but adequately describes the flowers most likely to be encountered by the visitor whose stay is limited. P.M.T.

Briefly Noted

I Like Caterpillars. By Gladys Conklin. New York. 1958. Holiday House. Illustrated in color by Barbara Latham. $2.75. A book for the curious young observers not yet ready for scientific texts.

Busy Water. By Irma Simonton Black. New York. 1958. Holiday House. Illustrated by Jane Castle. $2.50. Introducing the young reader to how water keeps busy as rain, river, ocean, cloud, and as rain again.

The Encyclopedia of Radio and Television. New York. 1958. Philosophical Library. 736 pages. $12.00. Second edition of this compilation of information in this area.

Lesser Worlds. By Nesta Pain. New York. 1958. Coward-McCann. 244 pages. Illustrated by J. Yunge Bateman. $3.75. British writer discusses effectively and popularly life among the ants, spiders, beetles, solitary wasps and bees.

Nature Is Your Guide. By Harold Gatty. New York. 1958. E. P. Dutton and Co. 287 pages. Illustrated. $4.95. A non-technical book that teaches one pathfinding in the wilderness, at sea, in the desert, in snow areas and under many other conditions.

The Eagle Pine. By Dirk Gringhuis. New York. 1958. David McKay Company. 181 pages. Illustrated by the author. $3.00.

The story of a boy in the lumber country of north-central Michigan of an earlier day.

The First People in the World. First Days of the World. By Gerald Ames and Rose Wyler. New York. 1958. Harper and Brothers. 48 pages each. Illustrated by Leonard Weisgard. $2.95 each.

Introductions to the beginnings of things for the younger reader.

Commercial Flower Forcing. By Alex Laurie, D. C. Kiplinger and Kennard S. Nelson. New York, 1958. McGraw-Hill Book Company. 509 pages. Illustrated. $9.50.

Sixth edition of this specialized and basic book, of which the title is descriptive.

Spiders, Scorpions, Centipedes and Mites. By J. L. Cloudsley-Thompson. New York. 1958. Pergamon Press. 228 pages. Illustrated. $9.00.

Guide to the identification and habits of British species.

Mining Threatens the Porcupines

An Editorial

MICHIGAN has perhaps the finest and most varied State Park system of all the States. Crown jewel of this system is Porcupine Mountains State Park on the Upper Peninsula, where some 58,000 acres of wilderness and shoreline embrace 46,000 acres of one of the two remaining virgin hardwood forests in the mid-West. Purchased by the State in 1944 at a cost of $1,800,000, the objective was "to preserve this virgin tract for all eternity."

"Here is a forest shrine that Michigan has decided to keep," wrote outdoor writer Ben East. "Here is a cathedral of trees that is to remain a cathedral. Here is a vast area of forest-cloistered lakes and foaming, brawling mountain rivers that are to be left in their wild setting. For that the people of Michigan may be grateful, and future generations of Americans will remember this state with gratitude."

Now, it appears, this vision of preservation "for all eternity," the concept of a wilderness to be kept ever thus, are clouded by a threat—copper mining. The State Conservation Commission has been petitioned for leases that would permit exploration and exploitation of low-grade copper sulphide ores underlying parts of the Park and the adjoining waters of Lake Superior. In buying the Porcupines, the State acquired only thirty-nine percent of the mineral rights. However, the principal ore deposits are presumed to lie under the Lake, which the State controls completely, as it does the adjoining lands involved in the petition.

In justification of its requests, the mining companies envisage a six-million dollar annual payroll, an increase in local tax revenue of some $200,000 a year, and a royalty income to the State of three-quarters of a million. These figures are being emphasized in a period of higher unemployment, but appear to be largely guesses. At the same time the mining interests admit that it may take five years for exploration to determine the place and extent of the ore deposits and twenty years to bring them into production—a situation, then, that has little relation to the current economic situation.

We have always questioned any attempt to place a price tag on the values inherent in a park or comparable area. However, the economic value of Porcupine Mountains State Park, in a State where the tourist business is second only to the automobile industry, should be obvious. Yet, to us, the spiritual and recreational values for posterity, which are a part of the preservation of such an area, are so great that they should in no way be compromised by the invasion of mining. And copper mining and refining are among the most devastating.

To some the area comprised in the immediate petitions may seem small in proportion to the total area involved. However, it is the little trickle of erosion that builds up to the destruction of the fertility of the land and the theft of the topsoil of a productive farm. It is the little invasion, the seemingly minor concession, that leads to the ultimate destruction of such a reservation as the Porcupines. One mining project would lead to another and to another. It would open the door to demand for lumbering and other exploitation, and would start downgrading the area so that its far greater purpose would be lost forever. Wilderness and wilderness values are irreplaceable.

Michigan conservationists are, of course, aroused by this threat. The Michigan United Conservation Clubs, the Michigan Izaak Walton League of America, the Michigan Botanical Club, the Michigan Natural Areas Council and many other State organizations are united in protest. They succeeded in having the decision of the State Conservation Commission, which on first polling of sentiment was four to three in favor of granting permission to mine, postponed until October or November. This gives citizens of the State an opportunity to express their individual and collective views to the Governor and to the members of the Conservation Commission in Lansing.

However, concern for the future of the Porcupines is not confined to the people of Michigan alone. Such an asset as this park is an asset of concern to all Americans. Conservationists in many parts of the country lent their support to the original campaign for preservation. Love of Nature and the outdoors is not limited by the artificial and non-confining boundaries of a State. We are a traveling people. We use automobiles manufactured in Michigan to visit Michigan. With the opening of the great bridge that spans the Straits of Mackinac, the Porcupines are made more accessible than ever, and will be visited and enjoyed by more and more people.

Michigan has an enviable record in the field of conservation of natural resources. Its Governor Williams has proved deep concern for conservation. Its Conservation Department and its Conservation Commission have pursued wise policies in the past. Thus, it is difficult to believe that the threat to Porcupine Mountains State Park will be allowed to continue as such. Certainly the dangerous precedent involved will be recognized for what it really is—a menace to one of Michigan's most enviable assets.

Bonaire's immaculate little airport greets its visitors with two flamingoes set in a tropical garden.

Bonanza for Birders

By ANNE LaBASTILLE BOWES

KARL MAYER

The brown pelican makes its home on the desolate west coast of Bonaire.

WE BLITHELY boarded our plane in the firm belief that we were on our way to Trinidad for Christmas vacation. Our tickets and baggage checks seemed to confirm this; but such was not to be the case. Even as we winged southward over the Caribbean to a tantalizingly tropical week of birding and photographing, we had no inkling of what lay in store. Our careful plans, built around birds as usual, were to prove as unsubstantial as the proverbial sand foundation. Birding, however, is often subject to change.

For more than an hour, the steward aboard the KLM airliner had been chatting casually with my husband, while I alternately dozed and nodded polite agreements. We had heard about his every port-of-call—their attractions and imperfections—and had about decided that the man was a talking travelogue. Yet, even in my half-sleep, I noticed the change in his voice when he mentioned Bonaire.

"Bonaire?" questioned my husband, Major. "Where's that?" The steward told us that Bonaire is one of the Netherlands Antilles, lying about fifty miles off the coast of Venezuela, and that it has no equal as a place to go for sun, peace, and relaxation—and birds, he added as an afterthought.

At that magic word, I immediately woke up, and assured our Dutch friend that birds were of the greatest interest to us, and that the main reason for this trip was to see and photograph new species. When he seemed thoroughly convinced about our odd avocation, I in-

The distorted form of a divi-divi tree near Bonaire's western shore has resulted from the constant pressure of the northeast trade winds.

The flamingoes of Bonaire live on a great salt flat, feeding on tiny brine shrimp and microscopic salt water life.

KARL MAYER PHOTOGRAPHS

Every movement of the flamingoes seemed to be in "slow motion." Thin, red legs bent and straightened rhythmically, and slim necks twisted sinuously. ↓

Below, a newly hatched flamingo chick gazes solemnly over the rim of its low, cylindrical mud nest.

quired as to what kind of birds lived on this isolated island.

"Flamingoes!" he said nonchalantly. "Hundreds and hundreds of them. They are always there, and very easy to see. In fact, they call Bonaire the Island of Flamingoes."

Major and I glanced exultantly at each other. For the past two years, we had kept up a frustrating acquaintance with a single handful of these wary individuals at the tip of the Florida Everglades. Many a day had been spent trying in vain to photograph them or even to get close, and they were still Number One on our "birds wanted" list. Perhaps on Bonaire we could meet our quarry face to face. It sounded too good to be true.

For the present, Trinidad was forgotten. We learned that by disembarking in Curacao, a regular stop, we could stay overnight in the KLM Guest House and hop over to Bonaire next morning on the daily flight. A hop was all it was—twenty minutes by air! Once there, the steward explained, there would be no difficulty in choosing a hotel. There was only one on the whole island, and it was seldom filled to capacity. Prices were low, about seven dollars a day per person, American plan, and the hotel's car could be rented for ten dollars a day, with gasoline furnished. The roads were good, and covered every part of the diminutive 27-by-7-mile island.

Noon of the next day found us lumbering off the plane at Bonaire, laden with cameras, telephoto lens, and overnight bags stuffed with bird books. By chance, we had been able to buy Voous's *De Vogels van de Nederlandse Antillen* in Curacao. Although most of the book was in Dutch, the colored plates and English summaries promised to aid us in identifying the many new birds we would see. Meanwhile, we decided we had never seen such a pretty, clean little airport. To greet us, two statuesque flamingoes stood in preening pose beside a pool set in a tropical garden. They represented Bonaire's "social hostesses."

At the comfortable Hotel Zeebad, a scant mile away, we were met by Karl Mayer, the large, kindly German ornithologist whom we had hopefully cabled from Curacao. He was the island's expert on flamingoes, and a fine wildlife photographer. We could scarcely believe our good fortune when he offered to show us the way to the birds—indeed, to show us the whole island. He explained that few birders came this way, so it was as much a treat for him as it was for us.

We drove south towards the island's tip, amazed by the scenery. Instead of the expected palm-fringed beaches and inland jungle growth, glaring white limestone stretched for miles ahead of us. Here and there, the expanse was broken by strange new trees, twisted

and bent by the sea winds. Shiny green gourds hung heavily from the calabash trees; the glistening, white-veined leaves of the toxic poisonwoods twitched in the faint breeze; and the trunks and branches of gumbo limbos, or saddle trees, writhed in snaky masses, like Medusa's locks. As we jounced along, iguanas and long lizards scurried for shelter, while frightened goats leaped away over low bushes. It was a limestone desert, inhospitable and sun-blasted.

Clumps of black mangroves began to appear as we neared the end of the island. We heard the startled cries of sandpipers, sora rails, and gallinules as we passed small pools of brackish water. At one bend in the road, Bahama pintails, black-necked stilts, and Hudsonian curlews flashed into sudden flight as we veered by. Soon our road was flanked on either side by water. To the right, low shell dunes held back the sea; while, to the left, an immense salt flat, five miles in diameter, lay ringed by mangroves. Mr. Mayer stopped the car. "There they are," he said. We squinted unbelievingly in the direction of the salt flat. Blinded by the brilliance of sun, water, and limestone, it took us a moment to adjust our eyes. Not a quarter of a mile from us, several hundred crimson birds waded ankle-deep in the shimmering water. Their every move seemed performed in slow motion. Thin, angular, red legs bent and straightened rhythmically, and long slim necks twisted sinuously. Heat waves and reflections gave the whole scene a soft, ethereal quality, and caused the distant land to undulate slowly, like northern lights in the sky. We gazed speechless at the birds, too awed to even think of our cameras. After so much time and film wasted in the past, it was unbelievably satisfying just to sit and watch them wading by without a hint of fear.

At the edge of a sun-baked limestone desert the twisted trunk and branches of a gumbo limbo tree writhe like copper-colored snakes. Not far from here the author and her husband saw their first flock of flamingoes.

"There are more!" exclaimed Mr. Mayer, pointing farther south towards some low stone walls that rose from the water. We were off at once, and found at least two hundred more birds feeding in the pinkish waters of a giant square pond. With elegant grace, the flamingoes swished their great black bills back and forth, side to side, through the water.

With a rather thick accent, Mr. Mayer explained that the pond, or "pan," furnished Bonaire with salt for

During Bonaire's dry season, water evaporates from ponds or "pans," leaving a layer of salt crystals that is broken up for export.

Below, the author stands beside one of the deserted slave huts, each of which housed four adult Negroes, brought to Bonaire to dig salt.

Brandaris Mountain, highest point on the island, looms up across an inland bay, somewhat resembling the famous Sugar Loaf of Rio de Janeiro in Brazil.

Why build a fence when Nature will grow one for you? The living cactuses below form an impervious barrier to man and beast alike.

export. In the dry season, the water evaporates, leaving four to six inches of pure salt crystals at the bottom of the pans. Since December is the "little rainy season," the salt flat is inundated, and no work can be done. Mayer walked to the edge of the water and said: "The pinkish color here comes from billions of tiny brine shrimp which thrive this time of year and are relished by the flamingoes. You no doubt know about the fine straining system in their mouths that filters the shrimp and other microscopic life out. At the next group of pans two miles on, the water is bluish from some other form of planktonic life, and the third series of pans are whitish."

Major, being particularly interested in the flamingoes' habits, asked if we could see them, too, so we drove down to the last pans. Here we found several tiny stone huts with peaked wooden roofs set in rows along the shore. "Is that where you store the salt?" asked my husband innocently. "Oh, no," replied Mr. Mayer gravely. "Those are the old slave huts!"

We looked at him incredulously. Each hut would have provided comfortable quarters for a Great Dane, but certainly not for a human being. Then Mr. Mayer told us how, years ago, slaves were brought from Africa to dig the salt from the pans. It was a much larger industry then than now, and the people worked all day in the sun and waded constantly in the highly saline waters. Most of them suffered sunstroke, and had running sores caused by the excessive salt solution on their skin. At night, they slept in the stone huts, four in each one! We felt cold suddenly, despite the afternoon heat, and involuntarily moved towards the car. It was decided to come back for pictures when the light was more favorable.

Next morning, Mr. Mayer came early to take us to the northern end of Bonaire. There, he promised us, we would find many new species of birds. Passing through the tiny red-roofed capital of Kralendik (Coral Dike), we drove along a fine paved road. The countryside began to change. Low rises became hills, and hills became mountains, the highest of which was Brandaris, 735 feet tall. It was cooler here, but still dry. Instead of lush vegetation, thin forests of gumbo limbo, honey mesquite and acacias grew on the rocky landscape. We passed through the village of Noord Salina (North Salina), keeping a sharp eye on the natives' faces. Here and there, we saw a green- or gray-eyed child with red hair, or an unusually light-skinned woman. These, Mr. Mayer explained, were traces of the old Caribe Indian physiognomy mingled with the Negroid features. In the early days, the first Negro slaves had interbred with the Indian inhabitants, gradually absorbing them into their own race. The people in this one town, however, had remained quite aloof from their neighbors through the years, and had hence retained more of the Indian characteristics.

Not far beyond this village, our road turned into a little-traveled, bumpy track edged with fences of living cactuses. On many of these cactus posts hung a chamber-pot, a goat skull, or an old coat. We were puzzled until Mr. Mayer told us that the Negroes place them there to ward off evil spirits from their homes and land. Moreover, said he, no sane person ever stayed outside after eight in the evening except during full moon. Every

A lizard, measuring more than a foot in length, sported an iridescent blue-green tail with spots to match. On Bonaire, lizards are so numerous as to sometimes clutter the roads.

colored man, woman, and child was locked safely in his house from dark to dawn to avoid ghosts. In a dip of the road stood two windmills. "We are now in Dos Pos," announced Mr. Mayer. "That means 'Two Windmills.' This is a good spot for birds."

He was certainly right, for the overflow from the wells attracted birds by the score. Flitty little bananaquits were everywhere, not to mention our old friends the yellow and myrtle warblers and southern mockingbirds. Suddenly, two handsome new species of hummingbirds danced by—the ruby-topaz and the emerald. A yellow-bellied sapsucker tapped his Morse code from the trunk of an acacia. Deep in the underbrush, sly rustlings disclosed a pair of eared doves and a single bare-eyed pigeon. We kept busy for hours with our cameras, binoculars, books, and check-lists.

As the afternoon sun lengthened the shadows of the creaking windmills, we walked a mile farther up the road to a fine view looking across a large inland bay to Brandaris Mountain. It resembled the famous Sugar Loaf of Rio de Janiero with its odd shape. Since the entire island is composed of diabasic rocks, it is subject to rapid weathering, and many bizarre shapes have resulted. By evening, we imagined we had seen most of Bonaire and its bird life, but Mr. Mayer assured us that we had not. For our one remaining day, he proposed an adventurous itinerary—sea-carved caves with ancient Indian inscriptions, divi-divi trees, and flocks of parrots. We accepted eagerly.

The excursion took us along the west coast, the one place we had not seen yet. Surprisingly, this section offered a different environment, with its own characteristic bird and plant life. Three broad terraces, each twenty-five to seventy-five feet high, told of Bonaire's early volcanic emergence from the ocean. Dense forests of organpipe cactus towered around us, while Spanish lady and melon cactuses filled in the understory. We made our way along a path, keeping a cautious watch for spines and thorns. Ahead, we heard a noisy scolding, and, seconds later, a flock of yellow-faced parrots alighted on a tall cactus. As we quickly focused the telephoto lens on them a mischievous billygoat suddenly jumped on top of a rock pile directly beneath the squawking birds. Instantly the whole group was in flight, leaving us with an unsnapped picture and an intense dislike for billygoats.

We ventured into the largest cave, a wide-mouthed, 300-foot-deep den, filled with nooks, crannies, and strange columns. Sculptured by waves when this part of the island was under water, these caves had served as homes for early Indian inhabitants. They had left their drawings in red paint on the ceilings, some resembling fish and sting rays, others serpents, and still others, nursery-school finger paintings. The dry climate and lack of destructive visitors had preserved the inscriptions for more than 400 years, and anthropologists had recently made surveys and taken pictures in an effort to decipher their meanings.

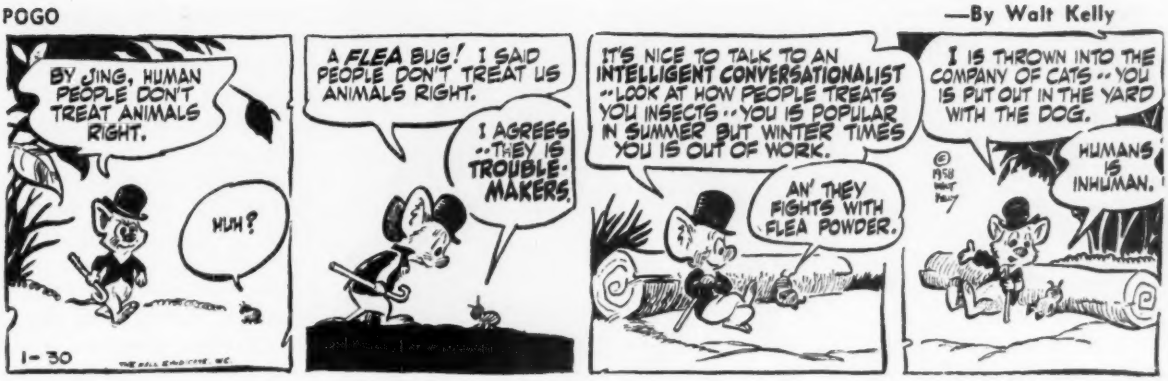
When we came back out, our parrot friends were there to greet us—this time without the goat—and we got good shots of them. Apparently they had brought company, for, in the bushes about the cave entrance, we saw Caribbean parroquettes, a rare pearly-eyed thrasher, two scaly-naped pigeons, and a white-tailed hawk soaring over the cactuses.

Heading westward toward the faintly booming sea, we saw our first divi-divi tree. Like a slender woman with long hair thrown over her head for washing, the tree bent out branches in only one direction as a result of the constant northeast trade winds. The divi-divi seemed to be the only living thing on this arid, rock-bound coast. The limestone here was black and pocked, like a moonscape. The rough seas dashed salt over everything. Only the brown pelicans, the ospreys, the gulls and terns were at home here. Even the ubiquitous goats were absent.

Along with a population of 5500 people, who subsist largely on goat meat, there are 35,000 goats on Bonaire. They devour every blade of grass, every seedling, and every leaf that grows within their reach. Erosion has long since claimed most of the top-soil, so the people are even more dependent on the animals that destroyed their prospects of growing food in the first place. While discussions take place among officials as to proper control measures, the goats calmly produce more goats, and the people refuse to do away with their life-line. It is the same old story—in miniature this time—of our country's own dust bowls and gullied hills.

With three hours left before take-off the next morning, Major decided to devote this time to taking flamingo pictures. Dawn had barely broken when we were on our way to the salt pans. The rosy hues of early morning deepened the color of the birds until they seemed afire, and the shallow water mirrored (*Continued on page 442*)

POGO —By Walt Kelly


BY JING, HUMAN PEOPLE DON'T TREAT ANIMALS RIGHT.
HUH?
1-30
A FLEA BUG! I SAID PEOPLE DON'T TREAT US ANIMALS RIGHT.
I AGREES --THEY IS TROUBLE-MAKERS.
IT'S NICE TO TALK TO AN INTELLIGENT CONVERSATIONALIST --LOOK AT HOW PEOPLE TREATS YOU INSECTS --YOU IS POPULAR IN SUMMER BUT WINTER TIMES YOU IS OUT OF WORK.
AN' THEY FIGHTS WITH FLEA POWDER.
I IS THROWN INTO THE COMPANY OF CATS --YOU IS PUT OUT IN THE YARD WITH THE DOG.
HUMANS IS INHUMAN.

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Villain of the insect world is

The Mighty Little Flea

By GEORGE S. FICHTER

I HAD our house all to myself for a few days last summer. My wife and children had gone to visit the grandparents. Even Hambone, the neighbor's dog, quit making his daily visits.

Then, one evening as I sat reading the paper, I felt my legs being bombarded by tiny pellets. Now and then there were sharp, stabbing pains, so I bent down to have a look. As my daughter would have put it, the "joint was really jumpin'." For there, before my eyes, a black swarm of little bodies bounced around on the rug. I had uninvited guests. Fleas! I dusted the house with a potent insecticide, locked it up, and joined my wife and children at the grandparents. I knew why we had fleas. Hambone, our boxer dog friend, ordinarily played host to them. In his absence, they had turned to me.

Flea problems were not new to me. Several years ago I taught zoology in a small university in the mid-West, and telephone calls from flea-troubled, near-the-campus residents came every season.

"I'm embarrassed to tell you this," was generally the way the calls began, "but we have fleas. They're all over our house, and we just can't understand why."

"Do you have a pet?" we always asked—and the answer, invariably, was an emphatic, "No, we don't, and that's what makes it so odd. You see, we did have a dog, but he died several weeks ago. Never in all the years he was here—and he had the run of the house—were we bothered by fleas. Now our house is filled with them. It's so strange. . ."

But it was not strange, really. Dog fleas like *dogs*, not humans, and roughly half of the fleas will be plump little females, each of which lays hundreds of eggs during her lifetime. Not in any particular place, nor all at one time, but here and there and now and then as she crawls about in the dog's hair. The eggs tumble out freely, and are scattered when the dog shakes itself or jostles as it moves about.

Five to six days later, a tiny, maggot-like white larva squirms out of each egg. Legless and with no eyes, the hairy raveling inches its way along by using the stiff bristles on its body to get traction, and it stays well out of sight, hiding in cracks between floor boards, in crevices of the dog's bed, or in seams of upholstered furniture. There, it gorges on an unsavory diet of organic scraps and dried feces from adult fleas.

Within two to four weeks, if it has found plenty of its kind of food, the wriggling larva measures about a quarter of an inch long. Then it spins a cocoon of fine silky webbing, produced by glands in its mouth. Bits of dust and dirt that adhere to the moist outside of the small, white capsule make it blend perfectly with its surroundings. After a week of quiet rest, under ordinary circumstances, an adult flea kicks its way out of the cocoon and goes hopping off in search of a dog. If none can be found, the hungry flea has no choice but to change diets.

So a few weeks after a pet has died or has been moved to new quarters is a likely time for fleas to begin making themselves obnoxious in their old host's haunts. They

bite voraciously, sinking their stiletto-like mouthparts into skin and tapping a flow of blood. Then they pump out the red fluid ravenously, and, if left undisturbed, they eat until their little abdomens are round and reddish.

Vacationers who pack Fido off to the kennel or take him with them are sometimes greeted at the door on their return by a hungry horde of these vampirish little insects. Fido seldom gets blamed. Why should he? He has not even been home! So when they summon a pest control man, they will tell him that their house is overrun with sand fleas. It sounds cleaner.

Actually, the abundance of little animals that greet the homecoming is an accumulation of Fido's fleas that have hatched during their absence. Fleas can live for two months or longer without food, but at the end of that time they are hungry enough to emulate Shakespeare's valiant flea, and feed "on the lip of a lion." Worse, they become much more numerous during the first day or so, since a fair percentage were still in their cocoons while the house was quiet.

PHOTOGRAPH BY H. ARMSTRONG ROBERTS

Two or three visible fleas on a dog may be an indication of a fairly large flea infestation, as the tiny animals make themselves as inconspicuous as possible.

Do not be deceived into thinking that, because you see only a flea or two on your dog, he does not have more. Fleas do not make a habit of flaunting themselves. I know a man who de-fleas his dog several times a year. One day, a month or so after the dog's regular treatment, he saw a single flea scurrying from one forest of hair to another under the dog's collar. There were obviously too few fleas there to be bothering the dog, but he decided to take a census anyhow. So he spread some papers on the floor, and then gave the dog a dusting with DDT.

Dazed and drugged fleas bobbed up like corks in a stream of water. When they stopped dropping, he had sixty-eight little brown bodies on the paper. Yet his dog, relatively speaking, was clean and well cared-for. It does not take long for a family of fleas to make themselves at home and become numerous enough to hold reunions.

On a dog that keeps one hind leg constantly digging at a flea bite while it gnaws industriously at another, the total flea population may run into the high hundreds. Raw openings resulting from the bites of the fleas, and the retaliating bites and scratches by the dog, are open avenues for all kinds of skin infections. And the fleas themselves, transferring from dog to dog, take with them tapeworm eggs and a variety of other vermin.

I have seen fleas seething—literally millions of them—on the dry, dusty floors of livestock barns. Pigs, especially, harbor fleas in abundance; but, oddly enough, fleas do not bother sheep. Instead, when fleas burrow into the sheep's wool, they get so hopelessly entangled they can not get out.

Few warm-blooded vertebrates are exempt from these bloodsuckers, however, and some species of fleas even inhabit the polar regions, snug and warm in living fur coats. The little insects also are found in the tropics, and during the second world war were introduced to isolated islands of the Pacific which, until then, had been free of fleas. In temperate regions, fleas are most bothersome during the warm summer months, overwintering in their cocoons if they are outdoors, but carrying on life as usual on pets indoors.

So far, entomologists have identified more than 1400 species and subspecies of fleas. Specialists in the study are called siphonapterists (Siphonaptera, which means "tube without wings," is the name of the insect family to which fleas belong), and they quip that they started in the business "from scratch." For more than half a century, the scientific flea center of the world has been the Tring Museum, at Hertfordshire, England, where Nathan Rothschild, son of the famous banker and financier, made a life-long hobby of collecting and identifying fleas. Now his collection is a part of the British Museum, although still maintained at Tring, and is presided over by flea authority F. G. A. M. Smit.

My personal interest in fleas was so whetted by their invasion of our house last summer that I set out searching for, of all things, a flea circus. I found one on 42nd Street near Times Square, in New York City, and I decided to visit it.

A flea circus is as portable a live-animal act as you could possibly conceive. Professor Roy Heckler, the operator, carries his entire ensemble in neat cases, inlaid with mother-of-pearl. There the fleas are bedded down comfortably in separate compartments with white wool and cotton blankets. Fifteen fleas are always trained and ready to perform. Three or four times as many are on reserve status. Those that are working get a full meal twice and sometimes three times a day; understudies are fed less often. And the feeding, if you are not squeamish, is another convenience. The Professor simply bares his arm and puts his herd out to pasture on it. Fleas—and his are human fleas—are not hard to please as long

as they are able to maintain their steady diet of blood.

Fleas, the professor explains to his audience, should not be disdained as ignorant. It requires an average of three weeks for a flea to graduate from its course of training as a full-fledged performer.

In the real life drama, fleas play the role of villains, for they are vectors for all sorts of pestilence. Tapeworms, tularemia, murine typhus—all can be transmitted by fleas. But the most notable malevolence to their credit is their syndication with rats in the spread of bubonic plague, a disease which has taken, over the years, a toll of some 150,000,000 people.

Fleas play their part on the team by passing the plague from rat to rat, and from rat to man; for the moment a sick rat dies and its body begins to cool, its contingent of fleas deserts it and goes looking for a new, warm home. Choice of a human being is generally fatal to the human.

Fleas are greatly flattened from side to side, an adaptation that makes it easy for them to slip through thick, close growths of hair. And hair is their trademarked habitat; so much so that in police circles, nowdays, shaggy juvenile sideburns are referred to as "flea ladders." Some fleas, like those infesting dogs, are decorated with short, stout bristles, directed backward so that they do not hamper the flea in moving forward, but give him a good support to lean back on. Typically, too, fleas have a hard, shiny exterior, so slick and polished that even if you do get your hands on one you will have a hard time holding it.

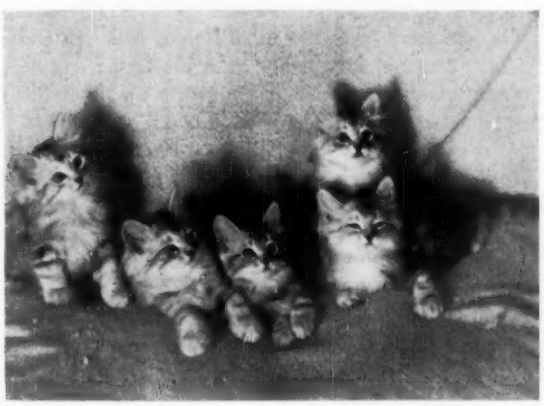
But their most remarkable feature—their ability to jump—prevents you from keeping them in sight for long, once they get out in the open. They have the reputation of being the most accomplished jumpers among insects, and have been credited with jumps more than seven inches straight up and more than thirteen inches horizontally. This, it is often pointed out, is comparable to a man leaping over the Washington Monument. But it is seldom explained that the flea's jump, while phenomenal, is not much more than you would expect of an insect with powerful jumping-legs. Like other joint-legged creatures, their muscles are attached to give them highly efficient leverage, and their feats of power and strength really are no strain.

Some fleas do not jump well at all compared with the human flea, which is credited as the most agile. Female chigoe fleas, which live in the tropics and ocasionally stray into our own South, pick a host and then stay by burrowing under the skin. Their fertile abdomens swell with eggs, and the surrounding area becomes infected. Sticktight fleas, or tropical hen fleas, hang on, too. But most fleas move about freely from host to host, preferring one particular kind of animal to another, but settling for blood wherever they can get it.

With fleas our close com- (*Continued on page 442*)

INTERNATIONAL NEWS PHOTOGRAPH

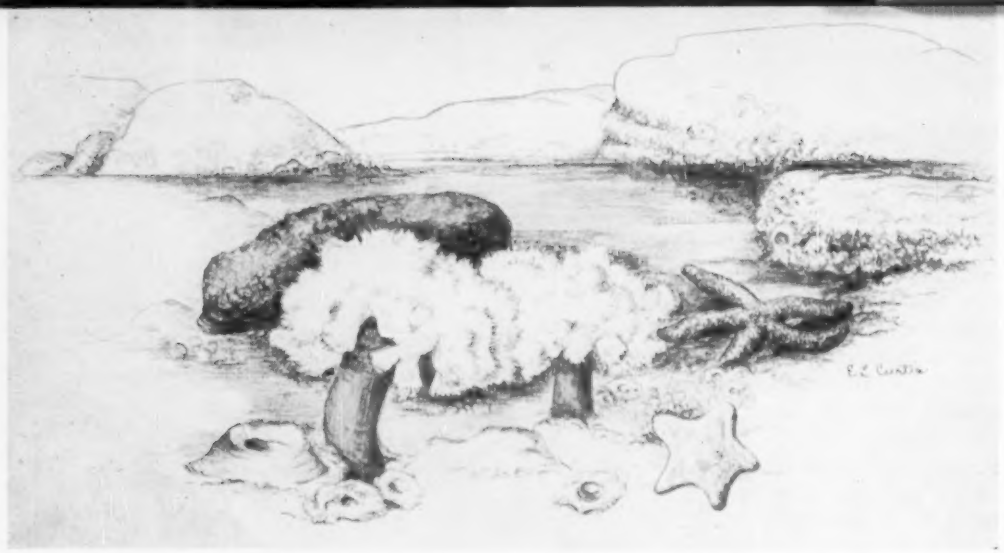
Considerable magnification reveals the short, stout bristles and hard, shiny exterior of the species of flea that infests dogs. Bristles are directed backward so that flea has no difficulty moving ahead through thick growths of hair.



PHOTOGRAPH BY MRS. GLADYS M. WATSON

Kittens appeal to photographers—and to fleas that may be in the vicinity. Most fleas move freely from host to host, preferring one particular kind of animal to another, but taking blood wherever they can get it.

Down through the years, fleas and rats have collaborated in the transmission of diseases, the most deadly of which has been the Black Death, bubonic plague, estimated to have taken a toll of some 150,000,000 lives. →



The visitors discovered on the Reef a great flower garden, with seaweeds of many shades of green, brown and red, fat sea-cucumbers, lacy bryozoans, sponges, and other plants and animals of the shore.

Summer's low tides revealed the wonders of

The Reef

Illustrated by E. L. Curtis

By MURIEL L. GUBERLET

A prisoner of the Reef is the piddock.

REEFS, half reality, half imagination, lie off most of our sea coasts, supporting an incredible number and variety of plants and animals, many of them beautiful and exotic. The inhabitants of these almost unknown areas are as old as time itself, yet they are visited by but a handful of men, for they lie buried beneath the water most of the time.

One such enchanting place is Parker's Reef, in the beautiful San Juan Islands of the State of Washington. The Reef is not hard to find, if you happen to be there at the right time. But if you are to see its wonders, you must be punctual in keeping the appointment. For the animals and plants of the reef are visible only on the days of the lowest tides of the summer months. If you arrive a few days, or hours, too early or too late, you will see nothing but miles and miles of water. Then the only hint that anything unusual lies beneath the surface is the flash, every four seconds, of a small white light, warning that treacherous rocks lurk below.

But we who have visited the Reef can testify to its treasures. A couple of summers ago, after consulting the tide chart carefully, Connie, Kirk, Roger and I set out in an outboard motorboat, on a bright sunny morning in August, from Echo Bay on Sucia Island. After traveling perhaps a mile and a half south, we saw a mass of rocks standing alone and bleak in a great expanse of water, with no visible sign of life. This was Parker's Reef, which a couple of hours earlier had been hidden below the surface, and which a few hours later would be buried again.

At the moment, however, the rocks were jutting their shaggy heads five or six feet above the surface of the water. As we approached them, we wondered what we would find of interest here. From the boat the prospect was not encouraging. Kirk shut off the motor, and he and Roger pulled the boat high on the rocks, so that the incoming tide would not carry it off before we had completed our explorations.

Above the rocky crags a convoy of gulls circled and dipped in the air currents, cormorants plummeted down with wide-open beaks to seize unwary fish or clams, and guillemots sped along close to the water. You may imagine our surprise and delight when we stepped from the boat and looked across the Reef to a great flower garden spread

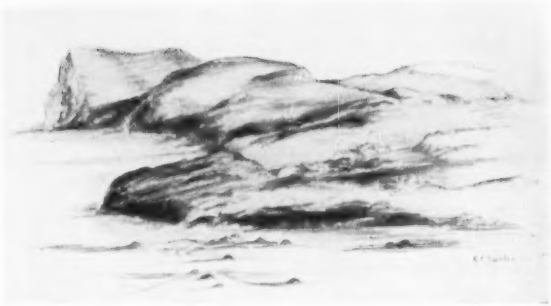
At the edges of some of the pools was the dark red cup-and-saucer seaweed.

before us. It seemed that all the plants and animals of the seashore were on full-dress parade, the drops of water clinging to them, dancing in the sun, and reflecting iridescent greens, purples, and blues. For a moment the dwellers on the beach had thrown off the bonds of darkness, and were preening themselves in warmth and sunlight. The air was pungent with the smell of the sea and the glory of the sun.

We stood gazing at the mysterious scene before us. Seaweeds in every shade of green, brown, and red were there. Nestling in this great rock garden were tidal pools of all sizes and shapes, their sides encrusted with bright red sponges and lacy bryozoans. In the pools, sheets of red-plumed chenille undulated with the moving water, while dainty sea lace, attached to the branches of Lyal's seaweed, was delicate enough to adorn the gown of a mermaid. Lying at the edges of some pools was the dark-red cup and saucer alga, while in shallow water between the crevices of the rocks lay the fat, warty sea-cucumber, looking for all the world like a foot-long weiner.

The pompom seaweed stood erect on its woody stalk, waiting for the return of the tide.

Floating on the water just at the edge of the reef was the long green-brown ribbon kelp, firmly attached to rocks far below. Although it was as coarse and heavy as rope, we knew that it often attains a length of seventy feet in a single summer season. On the exposed sides of the rocks, where the tide beats hard, lay the olive-colored feather boa, a seaweed eight or ten feet long, decorated with balls and disks and triangles, a fitting necklace for some monster of the sea, perhaps. In the deep crevices of the rocks the pompom seaweed stood erect on its woody stalk, the long graceful blades drooping



". . . the rocks were jutting their shaggy heads five or six feet above the surface of the water."

from it, waiting the return of the tide. Where the water fell off sharply at the edge of the Reef, great schools of tiny herrings and candle fishes dashed by.

Our wonder at the marvelous adjustment these animals make to their environment grew as we saw, clinging to the blades of the seaweeds, myriad tiny creatures, so perfectly adapted to their backgrounds in color and shape that we needed sharp eyes to detect them. Most easily seen were the olive-green isopods, two inches long, that live their lives as permanent dwellers on the blades of the ribbon kelp—a camouflage device that makes them almost invisible to their enemies. The colorful nudibranchs—snails without shells—also had taken up residence on the seaweeds, draping their egg ribbons over the waving blades. Rocking back and forth, these almost transparent, fairylike creatures exist by extracting oxygen and food from the moving water.

At our feet were starfish by the hundreds. In order not to step on them we had to walk carefully, for everywhere tiny, green, six-rayed species, ten-rayed rose forms, and gray and pink twenty-rayed sunflower stars with arms eighteen inches long clung firmly to the rocks. To us they looked like massive murals painted there for our enjoyment. In fact, the starfishes were so bright and gay we thought that Nature must have carelessly upset her paint bucket on them.

With its variously shaped ornaments, the olive-colored feather boa seaweed might make a fitting necklace for a sea monster.

Suddenly we were conscious of movement at our feet. The hermit crabs that usually live in tide pools seemingly were on a mass migration. These clever animals—anticipators of man's invention of the trailer house by millions of years—were rushing about, carrying their houses on their backs. Likewise, box crabs scuttled about, making confused wet tracks on the rocks. So we splashed on from pool to pool, wanting to look at one more pool or to gather one more shell.

In spite of the hundreds of animals on the Reef, a deep silence pervaded it. The only sound was the *click click* of the barnacle doors as these stay-at-homes, immersed in the tide pools, tried to watch the activity from the front doors of their limestone castles. Over all was an air of mystery and apartness. Even the slippery rocks and the slimy seaweed seemed other-worldish. It was like having time turned back millions of years to the days when the world was young.

For untold ages these animals have responded slowly and inevitably to evolutionary changes. On a reef, change is slow and time is endless. Life there goes on with no man-made hazards to threaten and destroy it. Yet, everything that lives on the beach is engaged in a pitiless struggle for existence, eating and being eaten, pursuing and being pursued, destroying and being destroyed. In spite of this ceaseless war, today each species of marine animal—from the tiny one-celled protozoan to the highly developed tunicate with the beginnings of a spinal cord—was enjoying its release from darkness.

While we had been looking at the great natural aquarium, the tide had reached its lowest level. The Reef was now about a quarter of a mile wide. As yet, however, we had not seen the animal we had made the trip to find. We had been told that the piddock, a clam that spends its life imprisoned in rock, could be seen on the Reef. High tide, low tide, sunlight or darkness probably meant nothing to it. So Roger and Kirk, armed with pickaxes and shovels, turned their eyes from the bright seashore garden and searched for small holes in the hard sandstone boulders from which we hoped to see projecting the siphons of the piddock.

After a few minutes, we noticed two dark siphons protruding about a quarter of an inch beyond the face of the rock. If we were to see the entire animal, we first would have to free it from its dungeon. Kirk began to wield the axe. He attacked the prison until it broke apart, and the thick, deeply lined shell of the piddock fell out.

Almost appalled by the piddock's way of life, we remembered from our zoology studies that the animal enters a tiny depression in the rock when it is no larger than the head of a pin. Once settled on the rock, the young piddock can not get out; a life sentence has been pronounced. It is forced to work constantly to make the burrow big enough to accommodate its growing body. As a result it digs in deeper and deeper until it is finally encased in the rock. Since the piddock's only contact with the outside world is through the original small hole, the siphon projects through it to bring in the plankton on which the animal feeds.

Strange as it may seem, the piddock bores the burrow by means of the rasping action of its shell. When the animal is young, the shell is provided with rows of sharp, sawing teeth, and as the animal twists and turns, the teeth wear away the rock at the inner end of the burrow. As long as growth continues, the piddock is obliged to work at the excavation. When the growth is complete, the shell grows over the rasping teeth and closes.

While we had been engrossed with the captive piddock, the tide had turned, and with each splash of the waves it was creeping back up the Reef, lapping gently over the weed-strewn rocks. Imperceptibly it came until the cold water was washing around our ankles. Suddenly recalled to the world of reality, we hurried to the boat. We stepped in and shoved off. Sitting safely in the boat, we watched the swirl of water under which the Reef was slowly disappearing.

Thinking about the animals we had seen, we realized more than ever the kinship between man and the great natural world. The Reef is inhabited by countless living, breathing, competing, reproducing creatures. Although each species obeys the pattern of behavior that is a law for its kind, the needs of these lowly creatures and the needs of human beings are fundamentally the same. Their hungers are our hungers, and, like us, they fight to the last breath for the precious gift of life.

As we turned our boat toward the Sucia Islands, a shiny black porpoise glided past, raised its fat body high in the water, spouted a column of spray, rolled over and disappeared. Our visit to the Reef was over.

THE SHREWD

The pheasants walk with confidence
Within this wood, respecting fence
And road so cannily, I swear,
Though their pronunciation, their
Word-grasp may differ some from mine,
They all read this "No Hunting" sign.

Elaine V. Emans

Patches

The story of a canine bird watcher.

By EDWIN WAY TEALE

Photographs by the Author

Patches, now nearly thirteen years old, still is an active bird watcher, and has probably seen more species of birds than any other dog in America. This photograph of Patches was taken on a field trip along the Gulf shore at Rockport, Texas.

Jack and Connie Hagar, with Patches. Ornithologists from all over the United States have visited the Hagars at Rockport, Texas, to see the rich bird life of the region.

PATCHES IS a bird dog with a difference. There are setters. There are pointers. There are retrievers. But Patches is a sitter. He rides in a car and observes the birds. He is a bird-watching bird dog.

This unusual activity had its beginning more than thirteen years ago. One morning early in March, 1945, Jack and Connie Hagar discovered a black and white puppy curled up asleep in a chair on the porch of their cottage at Rockport, on the lower Gulf Coast of Texas. How he arrived there or where he came from still are mysteries. Even his ancestry is a riddle. Each year, when he gets his dog license, he is described officially on the certificate as a "terrier mixture." Exactly what the ingredients of that mixture are nobody knows.

At the time he first appeared, Patches was about three months old. Almost every day during the more than a dozen years since, he has ridden with Connie Hagar on the field trips that have made her—and Rockport—celebrated in the ornithological world. Patches is more than a companion for a bird-watcher. He is a bird-watcher himself. He will lean forward to look through the windshield, following the flight of some flock of ducks or circling vulture as long as it is in sight.

One morning, a few years ago, when Connie pulled to the side of the road to study a small bird through her glasses, Patches peered intently down at a ditch on his side of the car. Then he looked at Connie. He glanced back, then looked at Connie again. This went on for some time. At last she leaned over and saw, standing in rigid immobility among the weeds only a few feet

away, an American bittern. As soon as he was sure she had caught sight of the bird, Patches heaved what seemed to be a sigh of relief, and settled down on the seat. He glanced at Connie as much as to say: "Well, you *finally* saw it!"

During migration, when the great flights of shorebirds and waterfowl, for which this part of the Texas coast is famed, reach the Rockport region, it is often Patches who notices them first. Early some morning the Hagars will hear him barking, racing from one end of the yard to the other, looking up at the sky and raising the alarm. Coming out, Connie may find the sky filled with snow geese, or see a great flight of long-billed curlews, or find as many as a thousand willets in one flock passing over the house.

Without doubt, Patches is acquainted with more famous ornithologists than any other dog alive. He has been the birding companion of such men as Ludlow Griscom, Roger Tory Peterson, Harry C. Oberholser and Robert Cushman Murphy. He has ridden with visiting bird-watching celebrities from virtually every part of the country. Almost invariably, Connie says, the same thing happens when the ornithological brass arrives at Rockport and starts out for an initial field trip. They look at Patches. Connie can read their thoughts: "Is HE going along?"

Then they look resigned: "Well, here go the birds!"

They expect him to dash wildly about, scaring everything in sight. But when they get out of the car at the end of the trip they look at Patches again and say: "I never saw such a quiet dog."

From the time Patches was a puppy he was trained not to disturb birds. Only when Connie claps her hands—a signal that sets him in motion as though a spring had been released—does he race ahead to put up the birds so observers can see fieldmarks that are revealed only in flight.

Because of the hundreds of visitors that have come and gone, Patches is slow to make new friends. What is the use? They stay only a few days, or a few weeks, and then go away. Occasionally he shows interest in visitors who have come back again and again. But most of his affection is reserved for the Hagars. And it is amply returned. If he had followed the whole length of the Texas coast, hunting a porch to curl up on, he could not have made a better choice.

Jack Hagar, a retired oil man, once defined his hobby as "seeing that my little wife and my little dog have everything they want." He chases armadillos away from the yard because they excite Patches. He feeds him the best possible food. He rushes out to help him drive off interlopers when Patches frequently tries to clear the yard, single-handed, of three or four dogs, all larger than himself. And he continues to train him in the way he thinks he should go. His idea of training is to yell at the top of his voice. New visitors to the Hagar cottages are likely to imagine that the dog is only an inch from annihilation.

Some years ago, a lady checked into cabin Number 3. Jack had just finished planting sod outside the window. The dog discovered it. He was having the time of his black-and-white-spotted life digging it up when he was caught in the act. The lady in Number 3 heard the uproar. Patches had run under her cottage. Jack was bellowing for him to come out. He would break every bone in his body! He would smash him flat as

Connie Hagar and Patches are ready for a field trip at Rockport, Texas. During the time of migration, when great flights of shore birds and waterfowl reach the Rockport region, it is often Patches who notices them first.

With advancing years, Patches seems to require more water than formerly, so Connie Hagar furnishes him with a pottery dish on the floor of the car between the seats.

→

On the road, the dog sometimes drapes himself over the back of the seat behind Mrs. Hagar, where, in midsummer, he makes a rather hot cushion for the driver.

↓

a pancake! The woman was wringing her hands, wondering what she would do to save the poor little dog that was going to be beaten to death outside her window. Just then, out came Patches. He romped up to Jack and licked his hand. The two went off together. She heard Jack saying:

"But, Sweetheart, Daddy hates to have to talk so rough to you. But it is the only way he can control you."

The first time I visited Rockport, I suspected that the Hagars gave newcomers the dog test. If Patches liked them, the Hagars liked them. I should mention that Patches bit me the first day I was there. But it was a friendly nip, given in play, and there were no hard feelings all around. The last time I saw him, a few months ago, he was nearing thirteen. He had grown a little less active, but was as alert as ever where birds were concerned. In recent years, as he has become older, he has increased the amount of water he drinks.

On every trip, now, now, Connie places a pottery dish of water on the floor of the Packard between the seats. Whenever Patches is thirsty, he jumps over and drinks his fill. The rest of the time he sits beside Connie on the front seat, or drapes himself over the back of the seat like a cushion behind her. This is his favorite position and, although he forms a tolerably hot cushion in midsummer, Connie humors him on every trip.

At the end of a field trip, Patches is wont to get his vitamins by picking sandburs from Connie's shoes, chewing them up, and swallowing them. For him, apparently, they provide a kind of bird-dog salad. Another favorite form of greens are the leaves and stem of the Virginia day flower that grows wild at the edge of the Hagar yard.

In his younger days, Patches often "took out" after jackrabbits, or tried to dig out gophers during field trips. On several occasions the rabbits eluded him by running out into water. Each time he would return in obvious disgust, looking at Connie as though he expected sympathy as the victim of an unfair trick. But never has he run away or failed to return to the car when Connie called him. His greatest pitch of excitement is aroused by garbage trucks. He invariably bursts into a frenzy of barking until Connie speeds up and passes them.

Ranking close to garbage trucks as a cause of excitement are snakes. Once he vainly tried to get out of the car and attack a stocky cottonmouth moccasin when I was photographing it beside a pond. On Patches' right jaw there is a small bare spot. It is a memento of an encounter with a copperhead (*Continued on page 442*)

Language of the Blue Jay

By JAMES H. GARDNER

Illustration by Bruce Horsfall

Thirty years of study have convinced the author that the blue jay possesses a language equal or superior to that of the crow.

"No one who has listened to crows will doubt that they have a language. Who can translate it?" asks Frank M. Chapman, in describing the American crow. The blue jay, too, has a language that probably is equal, if not superior, to that of the crow, and one that can be translated to some extent.

Thirty years of study in and around the yard of my home in Tulsa, Oklahoma, has convinced me of the truth of the above statement, and also of the fact that the dialect of the blue jay varies provincially. For example, the calls and inflections of jays I have heard in the State of New York do not conform to those of the Oklahoma area; so this story is limited to the latter province.

Many references have been made to the sounding of *jay* as a typical call, but the writer's ears fail to detect the sound of "j" in any of the bird's signals. He hears all the expressions tongued as beginning with "t" when heard nearby. For example, while I was holding a frightened jay in hand, it gave the loud call of *teéit-teéit*. The "tee" is highly accented, while the terminal "it" is but slightly sounded. At a distance, this may be heard as *tay-tay*, like an Irish "t," but the writer thinks that the jay's throat does not allow for the sounding of "j."

The signal or word *teéit* may be uttered singly and casually, but is usually doubled or trebled. It is the call for "come," or "help;" and when rapidly and loudly repeated is the assembly call for all jays to join and help harrass an enemy. Frequently one may observe the direct flight of a group of blue jays with the leader calling *tuéit-tuéit-tuéit* (rhymes with "blueit.") This means "come along," or "follow."

A jay, feeding alone, calls *treedle-treedle*. This is a query to mate or family group "Where are you?" The caller may follow with *teeit-teeit*, come. The announcement of position—"I am here"—the writer hears as *tseécurt*. In all these expressions, the first syllable is strongly accented.

I have noticed that a family of blue jays stays together as a loose covey, and does not break up until the nesting season of the following year. In order to keep the family group coordinated while searching for food, the words for "where," "here," "come," and "go"—*treédle*, *tseécurt*, *teéit*, and *tuéit* are most often heard, but there are various other expressions that have not been determined or understood.

During the siesta of a blue jay family on a hot day of late summer, the birds were sitting calmly on a shaded limb while one—no doubt one of the parents—was softly uttering *trit-trit-tee-tee-tee*, as if saying "Rest here a while." A family of jays sitting on a low limb above a cat sleeping on a porch chair bobbed their bodies up and down while uttering a guttural that clearly pointed out the enemy, with comment.

Gathering around a hated enemy, like the screech owl, the various family groups may constitute a considerable assembly. Ordinarily, however, the family group of the year stays associated, and when temporarily separated is from time to time reassembled and controlled by means of its language.

Other observers may hear the inflections differently, or not agree with these translations, but the writer has concluded that he understands some of the things that jays are saying. He feels that this little story will have achieved its purpose if it serves as an inspiration for further study of a bird language that is probably as advanced as that of any of the anthropoids.

An Essay in Commemoration

On the occasion of the centennial of Darwin's theory

By HAVEN KOLB

LATE IN THE year 1835, *H.M.S. Beagle* arrived in the Galapagos Islands, a small volcanic chain far out in the South Pacific Ocean. On board was a young English naturalist, veteran of four years of exploration in the rich lands and waters of South America, who easily could have been excused for thinking these bleak, semi-desert islands uninteresting. Harassed by constant seasickness and depressed by increasing homesickness, he nevertheless found these barren bits of land strangely fascinating. In particular, the small, dull-colored sparrows of the Galapagos seem to have impressed him.

Charles Robert Darwin (1809-1882) drawn by Garnet W. Jex from a photograph by Maull and Fox in *More Letters of Charles Darwin.*

Something about these little birds and their rocky, cactus-covered homes puzzled the young biologist, but at the time he could not guess why. So many sights and sounds, so many strange experiences had crowded the recent years! So many miles of Pacific and Indian ocean waters yet to pass astern before he would be home again! But in his notebooks and his journals he jots down all the details of his observations, and in his mind he records vivid pictures of island scenes. And, here in the Galapagos, something begins to crystallize—although perhaps but vaguely—from the vast tide of impressions that has been rolling over his mind since first he left his native land. He himself does not recognize this "something" as yet. It will be twenty-three years before the world hears of it. But when at last the world learns, there will be a thrill of excitement and a shudder of horror that will echo through the remainder of the century and leave a permanent mark upon the thinking of all men after him.

* * * *

The work of the scientist may take place anywhere. Some problems require an air-conditioned laboratory, some a telescope on a far mountain peak, some only a pencil and a piece of paper. The work of the scientist may occur at any time. Some young men not out of their 'teens have made important discoveries, some have labored long years before, in old age, they have concluded their studies. The work of the scientist may call to anyone. Some scientists have been led into the study of Nature in childhood; some have made careers in other fields before turning to science; some have only drifted into the field of science.

Charles Darwin was one of the drifters. He achieved his greatest fame rather late in life. He found his material everywhere. Many had better scientific training, many had better equipment, yet he alone in his century rocked the foundations of European thought with something that was not really new, and something that was of only slight practical value. How did he do it?

Although he came to be a biologist almost by accident, it was no accident that he was a thinking biologist; not a cook-book scientist, not a solver of little problems posed by others, but a scientist able to grasp the tangled threads of evidence in many fields, and able to weave them into a meaningful whole. In this sense, the preparation for his work was begun before he was born, in the habits, the activities and the tastes of his ancestors. Throughout his childhood, intelligent curiosity concerning the world and its inhabitants was an attitude expected of members of his family and his circle of friends.

There were no science scholarships in his day, and certainly no searching for science "talent." It is doubtful that he would have benefitted from either. He had an early education of the kind then considered good, he read somewhat, he dabbled in amateur chemistry

with his brother, and he started to follow in his father's footsteps to become a physician. Many a great biologist has begun his work as a physician, but not Charles Darwin. In fact, he did not like his medical training at Edinburgh, and did not take much interest in a course in geology—a science attractive to him as a boy—which was to become a keystone in his later work. Finally, he turned his thoughts to becoming a clergyman, and with that aim graduated from Cambridge University.

In after-life, Darwin regretted that he had had little or no training in three things—dissection, drawing, and mathematics. The classical studies he followed apparently were less distasteful to him than the medical, nevertheless. If he had no great enthusiasm for them, at least they gave him time to seek the companionship of many friends. From friends he learned a great deal, perhaps the most important lesson being that facts of importance may be gathered from all kinds of people and not necessarily from professional people only.

It was through one of these friends that he met the opportunity which was the turning point in his life. So, still intending to be a clergyman, equipped only with an amateur knowledge of geology, some experience in collecting beetles, and an inquiring mind, Charles Darwin, at the age of twenty-three, put to sea from Plymouth, England, on December 27, 1831.

Five years later, having sailed entirely around the earth, the *Beagle*, with the still-seasick Darwin, docked in England. In his baggage the voyager carried sheafs of notes, while in his head he carried the reflections of a thousand scenes and hundreds of unanswered questions that his observations had aroused. As he set to work preparing his official report, the sights and experiences were all relived, and in the comfort and leisure of London many of the queries he had hastily jotted down during the constant movement of the voyage began to relate themselves one to another. The tremendous variety of plant and animal life that he had encountered seemed to require some explanation—those odd sparrows in the Galapagos, for example, all so much alike, yet the birds on each little island with some odd characteristic of their own. And the geological problems—the origin of islands in the open ocean, for example—could there be any relation between these problems and the biological ones? If rocks, islands and continents could change with time, might not time also bring about changes in living things? Indeed, domesticated animals and plants had changed. How?

Already richer than any other English naturalist in first-hand knowledge and experience of the breadth and wealth of the living world, Darwin now patiently began to collect evidence on the variations in domesticated life from seedsmen, farmers, animal breeders, and from his own experiments. At the same time, he dug deeper into the accumulated knowledge of geology. Bit by bit he built up a mass of evidence showing the progression of fossil life in the rocks from older to younger. The necessary time for change to occur was an important point in his developing ideas, and the geological evidence for an ancient earth had to be sifted. The manner in which plants and animals are now distributed over the surface of the earth could be linked to the past distribution of possible ancestors of present-day organisms. So the reports of all the exploring expeditions then being sent out by many nations were eagerly read. Although he had had but little contact with laboratory biology, he recognized that the structure of present living things might hold clues to the structures of their ancestors, and evidence of how the structures may have changed. Likewise, in the manner in which plants and animals develop as individuals, there might be some clues concerning how groups of animals and plants might have developed. So the field of embryology was studied.

As the years went by, the hill of suspicion grew into a mountain of facts, all pointing to the conclusion that, through a long world history, living things had indeed changed. But still lacking was a guiding force. Animals and plants varied, but why did some variations survive while others did not? If Darwin had known only the peaceful English countryside, he might long have wondered, but the first glimpse of the riotous Brazilian jungle still remained vivid in his mind. The infinite variety of ways in which the luxuriant plant life of the tropical forest struggled to reach the light was a lesson. With this in mind, the struggle for existence then could be detected in all kinds of habitats. It was but another step to the conclusion that those plants and animals least adapted to their surroundings would be most likely to succumb to the struggle, and so fail to leave descendants. Now the circle from plant and animal breeder into the jungle and back was completed. As the husbandman selected the variations most suitable to his purposes among domesticated organisms, so Nature selected the variations most suitable to her purposes.

It is one thing to convince one's self, and another to convince fellow scientists and the public. Darwin still kept his ideas unpublicized. As patiently as he had gathered evidence, he also gathered possible objections. Contrary evidence was examined. Flaws in reasoning were worked over. Alternative methods of explaining the facts were tried.

Nearly a quarter of a century passed. Perhaps Darwin might still have continued his researches without publication. But one day a friend, with whom he had discussed his theory, informed (*Continued on page 445*)

EXPLANATION

God scrawled three golden sentences
In lightning on a blackboard sky
And then erased them all before
I read one word. I wondered why

Until I heard the thunder speak
This explanation through the night:
"Truth must remain remote and brief,
Else it will blind you with its light."

John D. Engle, Jr.

In the early morning, a quiet cove may be as untouched and self-perpetuating as a hidden glen, and investigation of the life of the pond during an unhurried hour may become a long-cherished experience.

Visit to A Pond

By WILLIAM HOPKINS AMOS

Photographs by the Author

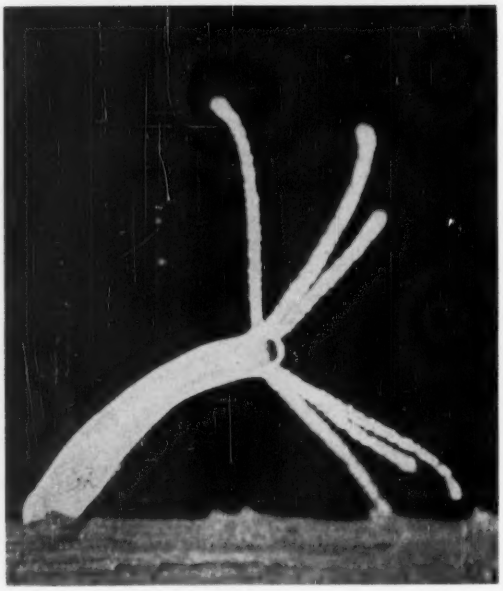
A POND HAS a life of its own. In a way, it is a living thing, for, unlike larger bodies of water, it has a beginning, reaches maturity, and then commences a long decline into senescence and eventual disappearance. A grove of trees flourishing in rich soil may be the only indication of the grave of an ancient pond.

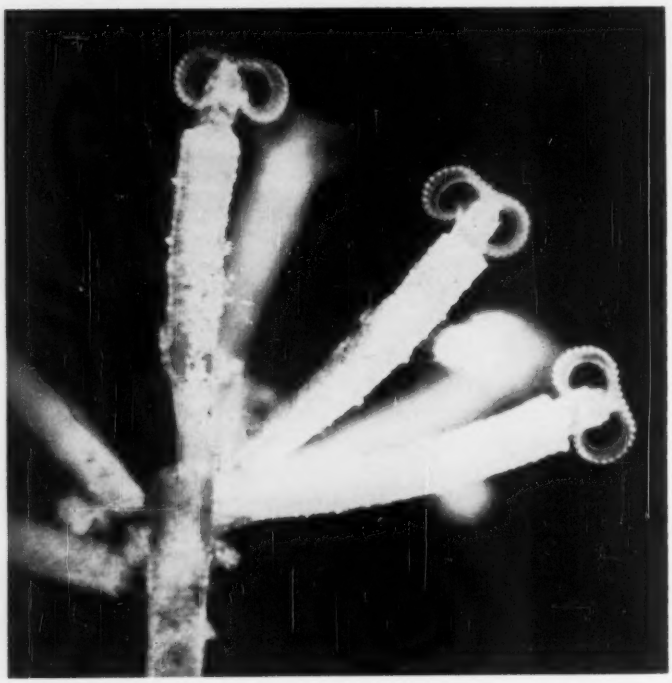
Young ponds, like young organisms, are simple and uncomplicated. Old ponds may be barren, and incapable of supporting much in the way of plants and animals. But a mature pond, in the glory of its productivity, possesses as complex an existence as any advanced organism, and holds to itself a dependent wealth of living things. A man's lifetime is too short for a thorough understanding of the vagaries of a pond's subsistence, or of the cyclic histories of the multitude of lives that depend upon its presence; yet a pond usually is considered insignificant, to be tolerated or drained.

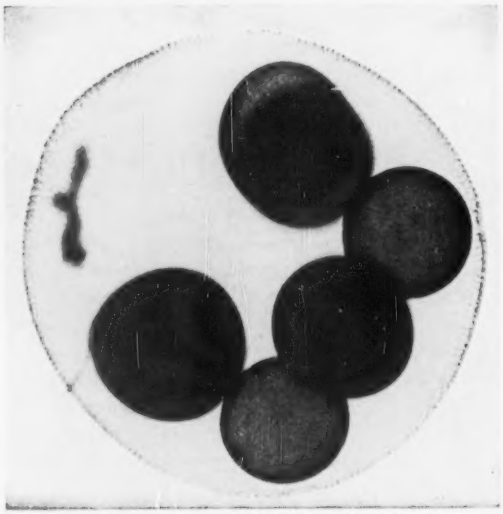
Photographs may show the image of a pond in different seasons, but they can not record the diverse factors that compose and influence a small body of water. How can a camera capture subtle stratifications of temperature, oxygen diffusing through the surface to dissolve in water, and carbon dioxide departing into the air? Can it show the use of nutrients in bottom mud by aquatic plants, and the eventual decomposition of those same plants until organic nutrients are liberated once again? Wave dynamics and circulation patterns must be recorded by specific instruments that will provide data to be interpreted by the mind of man—they cannot be pictured simply.

The photographs shown here may stimulate a reader's curiosity, but to *learn* something about a pond, he must, first of all, observe at great length, and then consult recent works on limnology, hydrobiology, or hydrology. Perhaps then that nearby pond, disregarded for so long, will begin to divest itself of some of its secrets.

A few drops of water from stems and undersurfaces of aquatic vegetation often yield a variety of small forms of life. For many of these a low-powered microscope is necessary; for others, a simple magnifying glass is sufficient. Picture at upper right shows trumpet-like *Stentor*, *Paramecium*, and sun animalcule, *Actinosphaerium*, that has captured in its radiating protoplasmic strands a ciliate, possibly *Tetrahymena*. Sometimes the small brown *Hydra oligactis* (right, center) is seen in profusion on under-water leaves, spreading its tentacles in the water to trap even smaller swimming worms and shrimps.

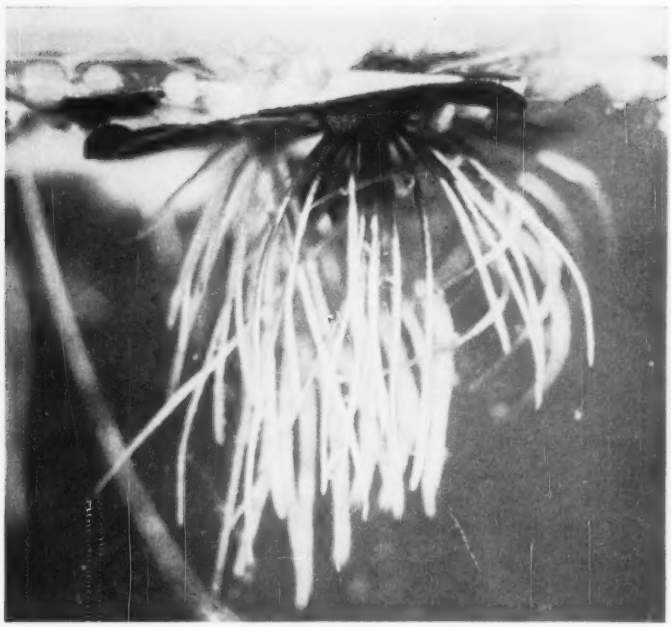




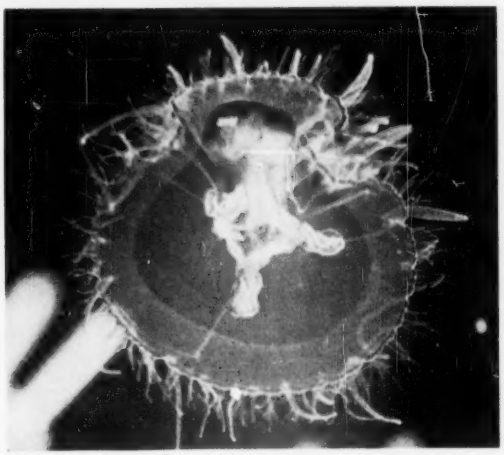


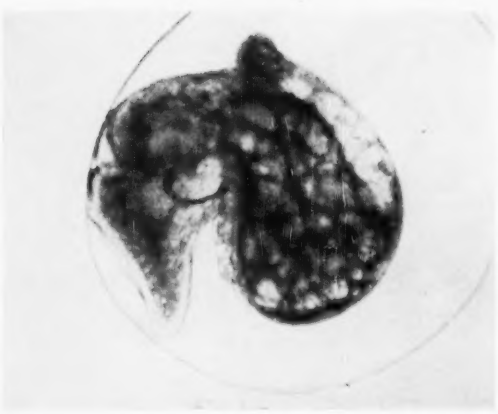
The Rotifers, labeled by early biologists "wheel animalcules," spread ciliated lobes in the water, creating a vortex into which are drawn all kinds of prey. Those pictured above, *Floscularia*, dwell in protective tubes of their own making. One of the strangest of the minute pond dwellers is *Volvox*, (lower right) a colony of flagellated cells. Daughter colonies develop within the parent, and when mature burst through its walls, leaving it to die.

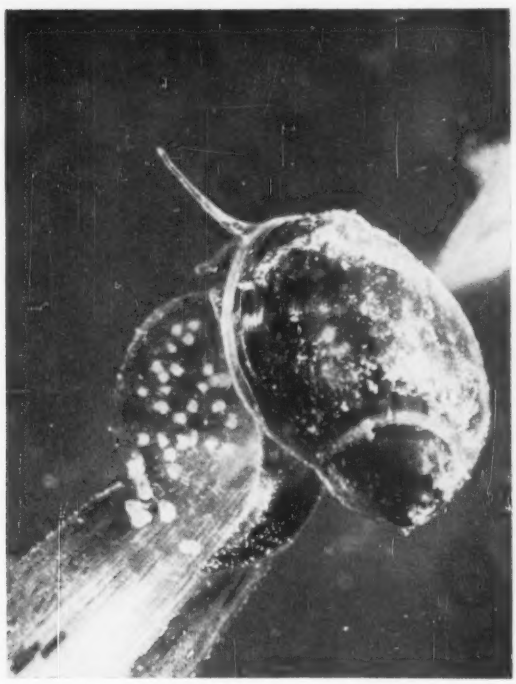
Along the shoreline, a dip net passed over the bottom and through reeds usually will reveal a surprising number of small living things. One of the rarest finds brought in would be the fresh water jellyfish, *Craspedacusta*, (below), a transparent pulsating creature about the size of a nickel.



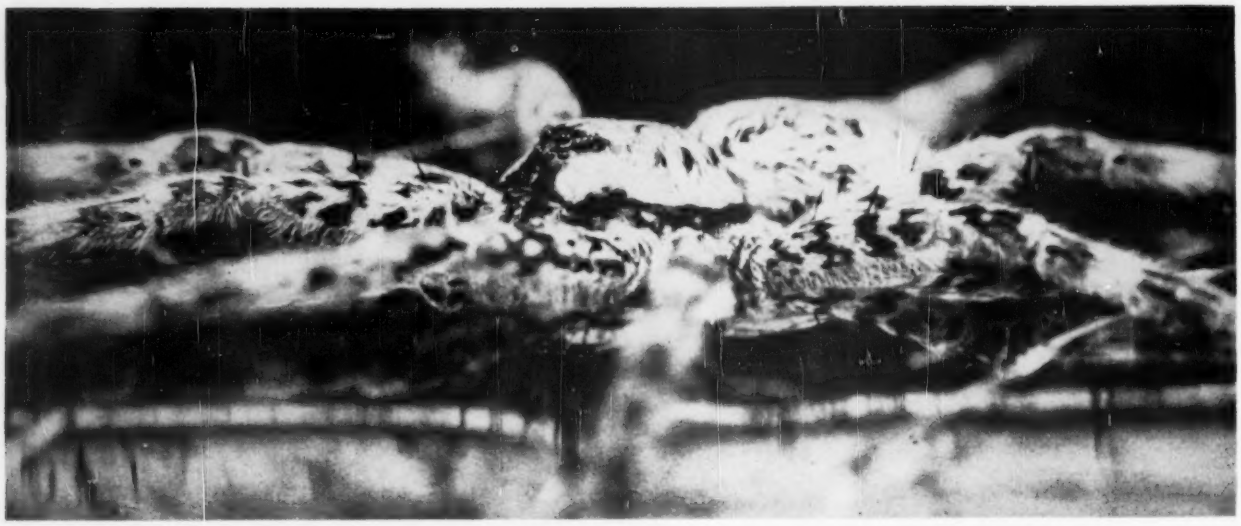
Floating on the surface, clover-leaved duckweeds, *Spirodela*, extend their tiny and thoroughly aquatic roots into the water. The inhabitants of these roots, other tiny plants and animals, have fascinated microscopists from the time of Anton van Leeuwenhoek, an eighteenth century observer.





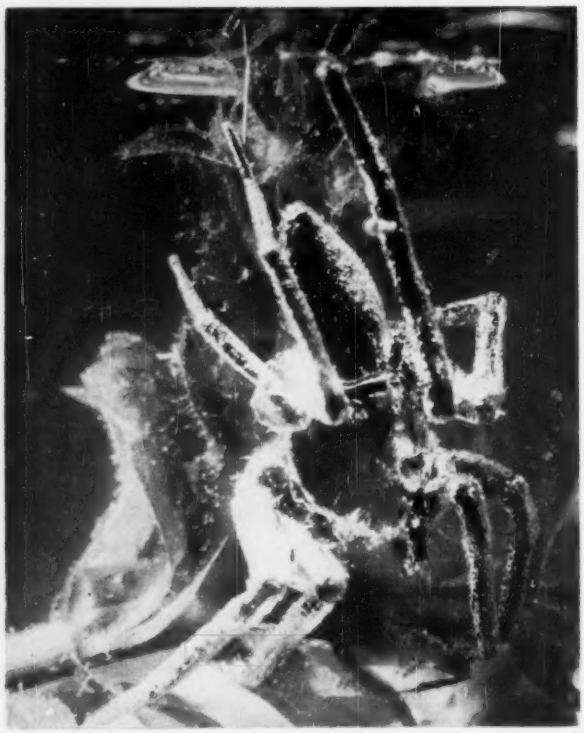


Pond snails share with most other members of their group one convenience—they are at the same time male and female, and can deposit fertilized eggs without the presence of another adult. Above, *Physa* is shown depositing a mass of eggs in a gelatinous matrix. At bottom left, the same eggs viewed under a microscope a while later show a surprising amount of development. Within the confines of each egg an embryonic snail, complete with a delicate and transparent shell, twists and rotates within its protective prison.

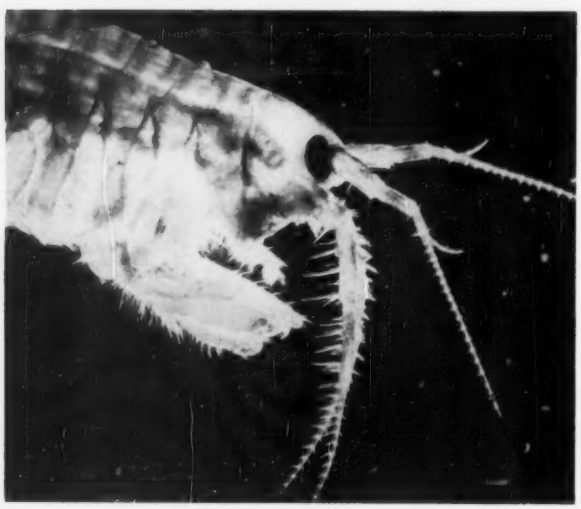


The surface film offers a smooth, almost limitless area to those animals sufficiently light to be supported by it. The large fisher spider, *Dolomedes*, distributes its weight evenly upon its eight long legs.

Perhaps the most common pond crustaceans visible to the unaided eye are the scuds, *Gammarus*. (right, center) Here male and female cling together in preparation for fertilizing eggs that will develop within her brood sac, as the young are not set free in a larval stage.

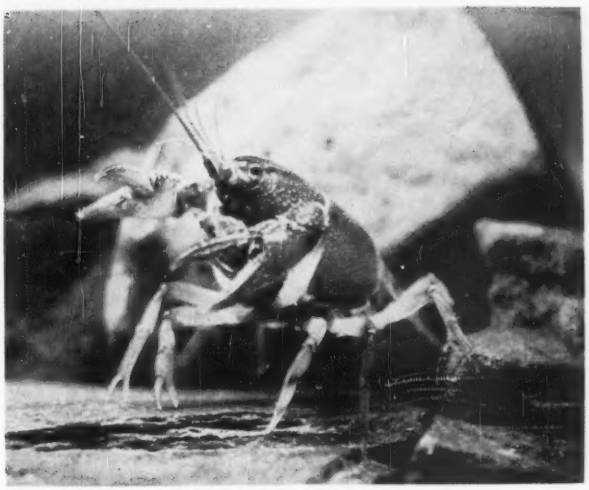


When frightened or seeking prey, fisher spiders dodge quickly beneath the surface film, where their bodies glisten with a silvery coating of air. Drawing upon this air, they may remain under water for half an hour.

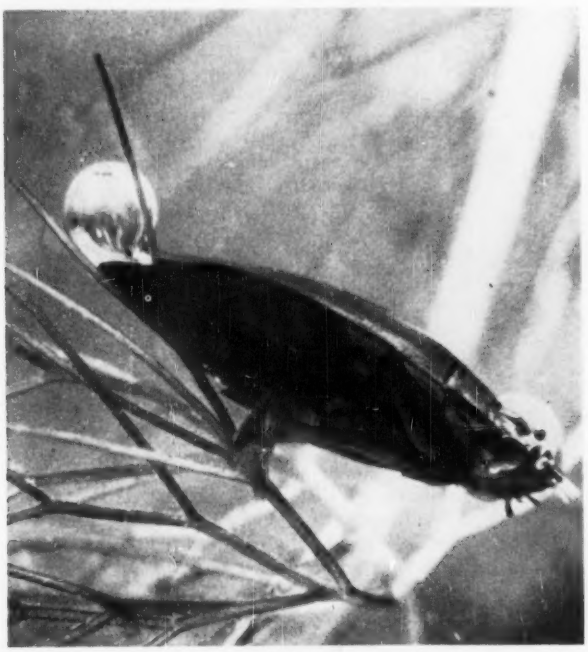


When viewed closely, *Gammarus* (right) is seen to possess a variety of specialized appendages and a complexity of structure not suspected in so small an animal.

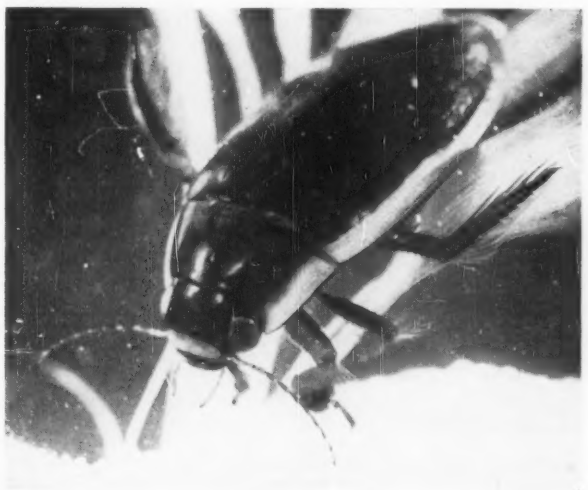
Under normal conditions, ghost shrimps, *Palaemonetes,* are all but invisible as they glide across a pond bottom, but closer inspection of their transparent bodies reveals scattered pigment cells that show clearly in a photograph.



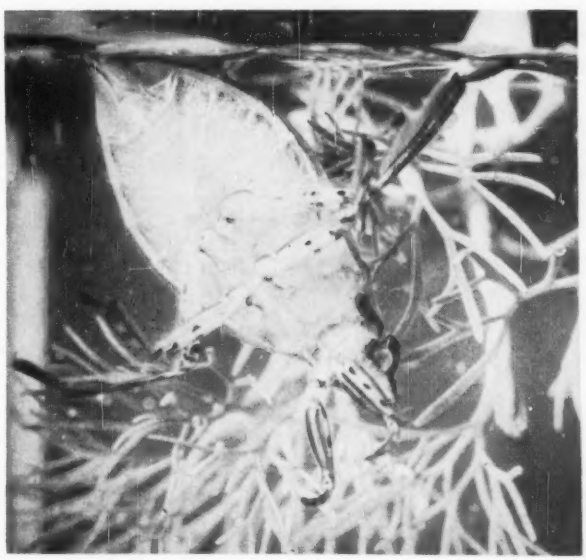
The crayfish is a pond's knight-in-armor, although its behavior hardly follows suit, for it is a scavenger and feeds mostly on decaying organic matter. The one shown here is a chimney crayfish, *Cambarus diogenes.*



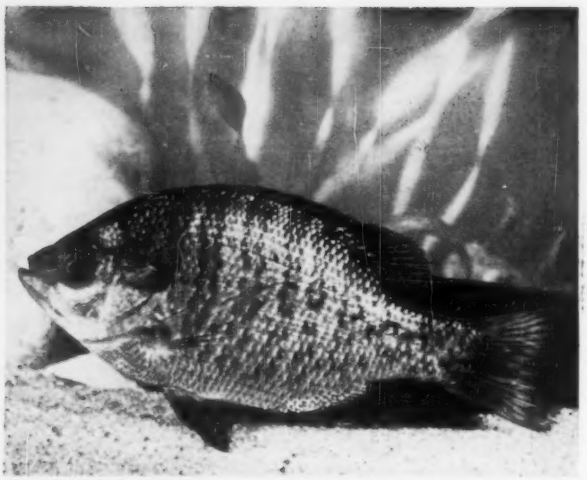
When a whirligig beetle, *Dineutus,* descends to lower regions, it must carry a supply of air. Some of this air is carried under the wing covers, and some is trapped in bristles around the head and abdomen.



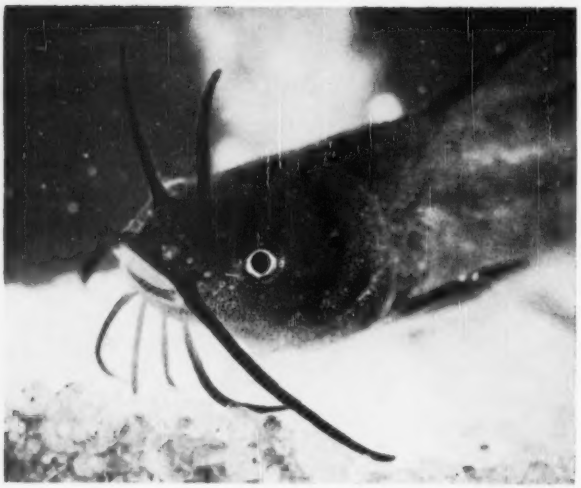
The large diving beetles, *Dytiscus* (right, center) are such powerful predators that it is not unusual to find one that has captured a large tadpole or small fish.



All fully grown insects that live in water breathe air as do their terrestrial relatives. In photograph at right, a broad water scorpion, *Nepa apiculata,* is seen drawing in air through a tube of bristles that penetrates the elastic surface film.



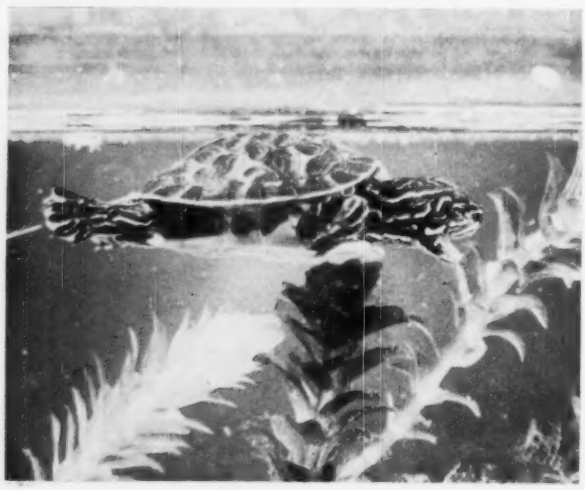
Few pond fishes are more popular with anglers than the sunfish group, of which the bluegill, *Lepomis macrochirus*, is a member.

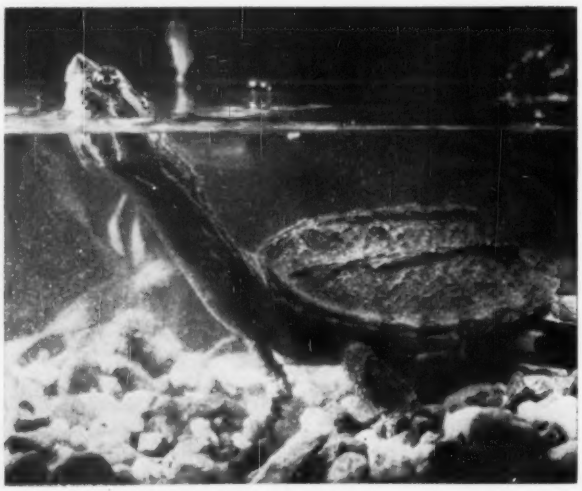


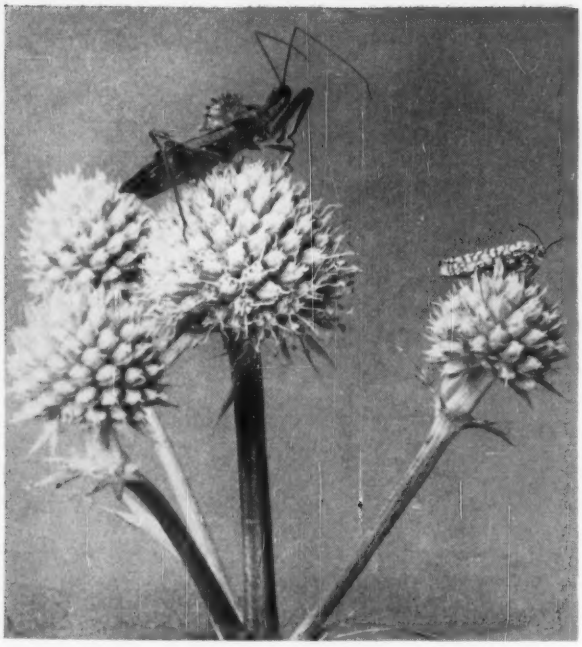
Small catfish like *Ictalurus nebulosis*, above, are a part of pond life, even when the nature of the water is such that it will not support other fishes.

Large cannabilistic amphibians, like the bullfrog, *Rana catesbiana*, above, not only compete actively with each other, but also are hunted by man. Below, the map turtle, *Graptemys geographica*, is about to remove a leaf of *Elodea*.

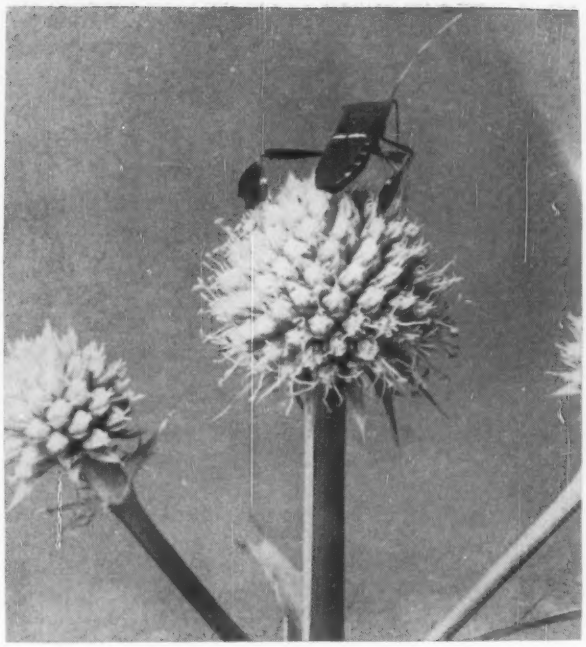
The immature salamander above does not differ greatly from the adult, except that it removes oxygen from the water through gills rather than with lungs. Below is shown one turtle that is almost exclusively carnivorous, the eastern snapper, *Chelydra serpentina*.







At Nature's nectar party, death awaits the careless. Here a wheelbug stalks a "Mother Hubbard" moth that has just alighted on an adjoining Eryngo flower-head.



A cousin of the wheelbug, a yucca-plant bug, *Leptoglossus phyllopus*, turns its back on the photographer. It may have confused Eryngo with a nearby yucca.

The Guests of Eryngo

By RALPH J. and MILDRED L. DONAHUE

Photographs by Ralph Donahue

THE flowers of the dry-pasture plant, *Eryngium yuccafolium*, more commonly known as rattlesnake-master, or Eryngo, are—to humans, at least—without odor. Encased as they are, each in a tiny green cup, they seem hardly large or bright enough to attract passing insects. Yet, during July and August, the nectar of this plant is seldom neglected.

To learn something about this perennial and its insect guests, we moved a thrifty clump of *yuccafolium* into our wild garden plot last fall. This past spring, some sixty spikes lifted more than a hundred burred flower-heads to the sun, and, with the advent of summer, we prepared to photograph the invited guests, as well as a certain number of insects who came to prey on the guests.

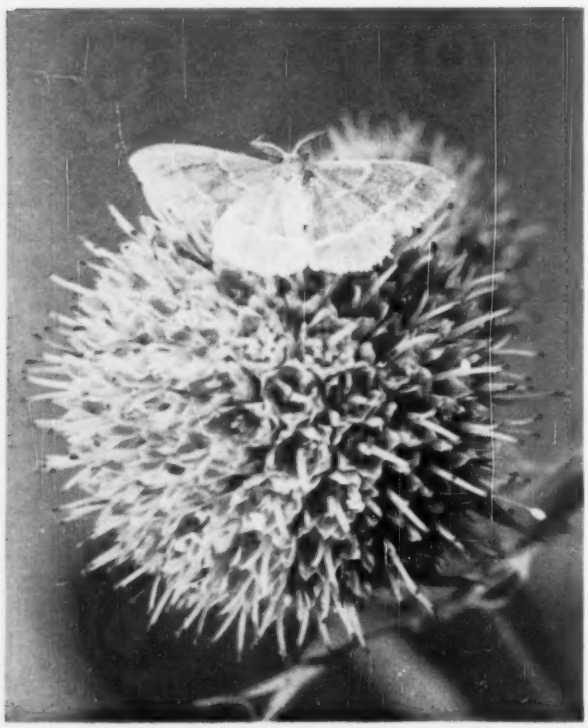
We soon found that the list of guests was a long one. Bees were numerous, and included many from local hives. There was a host of halictids. There were leaf-cutters, bumblebees, and many kinds of wasps, flies and butterflies. And there were the predators, the "party-crashers," ever ready to make a meal of an unwary guest. Summer has passed, and we have renewed our acquaintance with many interesting insects. In a way, we feel that we, also, have been invited guests at the feast of Eryngo!

A satin-black spider wasp of the family Polilidae spent most of its time giving itself a rubdown, while below, a checker-spot skipper has its wings closed over its back and antennae drawn down beside its body to keep warm in the cool morning air.

Vicious in appearance, but quite harmless, was the yellow-banded black mydas fly, *Mydas clavatus*, that was a frequent visitor at Eryngo's nectaries.

A male goldern-ringed Elis wasp, *Elis quinquecincta*, was seen daily at the flower-heads. The females of this species were not seen as frequently as the males.

From a larva found on an Eryngo flower-head, the authors raised this pale green moth of the genus *Synchlora*. After taking its picture, they found they also had photographed the stalked egg of an aphis lion (lower right in picture).



A tattered buckeye butterfly has come to grief on a flower-head, seized and killed by a yellow and brown ambush-bug. Photograph shows the ambush-bug moving away after its hiding place on Eryngo is discovered.

PHOTOGRAPH BY RICHARD HARRINGTON

Supplementing the Indian's hand-picking of the wild rice crop are the mechanical pickers of the white man, which go into action if the Indians wander off before the harvest is complete. Zenobe Durand of Winnipeg, Manitoba, operates a mechanical wild rice picker of a new design, his own invention.

Indian Harvest

By ANNA TILLENIUS

MOON OF THE WILD RICE—that is the name for September among the tribes of American Indians that gather on the shores of shallow lakes and marshes to set up camp for the harvesting of their traditional crop of "menomin," or wild rice. For this aquatic crop is ideally suited to the nomadic way of life of the Plains tribes, a crop that requires no sowing or cultivation, but which lies waiting for the harvest.

Along a narrow belt on the east side of Lake Winnipeg in the Province of Manitoba are situated some of the finest wild rice fields in the world. When blueberry picking is finished, Indian families of sixteen and twenty, made up of grandparents, aunts, uncles, cousins, and numerous children move into the area adjacent to the rice fields. They set up their nondescript camps on the shores of Horseshoe, Little Whiteshell, Echo and Lone Island Lakes, and in the Pine Falls area, in readiness for the harvest of menomin.

Two Indians to each canoe, they push off. The one in the bow slowly poles the canoe through the towering rice stalks, while the second Indian kneels amidships and deftly bends the tall, slender, grass-like stems over the side of the canoe with an eighteen-inch-long "picking stick," while with a second "picking stick," held in the other hand, he gently taps off the rice heads into the bottom of the boat.

Rhythmically swaying from side to side, the picker bends the pliant stalks inboard, gathering alternately from each side of the canoe while his gentle tapping showers the ripe rice kernels on the floor of the canoe. Back and forth across the lake the canoes glide, making each new swath as close as possible to the last. Finally, the rice-laden canoes, riding low in the water, are slowly poled to shore by the dark-skinned harvesters.

Over slow fires, leathery-faced squaws now parch the green rice in battered basins and old pots to loosen the hulls. Then the men and young boys "dance the rice" in a hole dug in the ground, holding on to a bucking beam and chanting a monotonous rhythmic tune while jigging up and down on the rice in mocassined feet to remove the hulls. The rice is ready for cooking after small quantities of it have been scooped up in birch-bark winnowing trays and tossed and caught in the air as the wind blows away the chaff. Before the Indians feast on the first wild rice of the season, a small quantity of tobacco is cast on the waters of the lake as a thank

One Indian poles the canoe, while the second bends the stems of rice and taps the grain-heads into the boat.

PHOTOGRAPHS BY DUCKS UNLIMITED, CANADA

Above, Indian women parch the rice over slow fires to loosen the hulls, using hoes to keep the grain from burning, while, below, men and young boys in mocassined feet "dance the rice" in a hole to remove the hulls.

offering to the Great Spirit for a bountiful harvest.

But the bulk of the wild rice crop will not be processed by primitive Indian methods and stored in birch-bark "rogans" for winter sustenance. It will be bought from the Indian pickers by the white trader, who has laid his commercial hand on this age-old Indian crop, and has devised mechanical ways of harvesting and finishing wild rice to such a degree of perfection that this cereal finds a ready demand on the American market, retailing at about two dollars and fifty cents a pound—the world's most expensive cereal! Moreover, wild rice, which from time immemorial sustained North America's aboriginal tribes, and served as "iron rations" for explorer, trapper and missionary, has become a gourmet's delight and a feature dish at expensive hotels.

Wild rice grows from eight to twelve feet high in marshes and shallow lakes with thick, rich bottoms; its flower head, which is yellow and purple in color, ripens from the top. The level of the water in the lake or marsh is all-important to the rice plant. From four inches to four feet—no more, no less, for this plant is an annual that sends up from seed, in the spring, a floating leaf, which lies on the surface of the water, and which is the plant's contact with the life-giving sun. If the floating leaf becomes submerged by high water, the crop for that year will be a failure. However, many seeds lie dormant; they do not germinate that year, but are ready to begin life the following spring. This is Nature's insurance that wild rice will continue to grow in lakes and marshes in spite of flooding.

Because the finest grade of wild rice is obtained by Indian pickers, this primitive method of picking rice continues. There is an agreement that Indians should be permitted to add to their slender incomes by harvesting their traditional crop, like the arrangement between the Indians and the State of Minnesota in the United States. But when an Indian suddenly feels rich with his first earnings, and wanders off before the harvest is complete, the white man's harvester swings into action.

Most of the mechanical pickers look not unlike the conventional grain binder. But last fall, during wild rice season at Harrop Lake, I saw a mechanical picker, invented and built by Zenobe Durand of Winnipeg, that embodies a new principle. The craft, entirely built of aluminum, is propelled by a three-horsepower outboard motor that can negotiate fairly thick weed beds without fouling. When the crop is ready to strip, the craft is brought into position at the edge of the rice bed. Seen from in front, the twenty-one-foot tubular bar is suspended crosswise directly over a shallow-draft aluminum boat, to which it is firmly bolted.

On either side of the boat, nine aluminum scoops, approximately nine inches wide, are attached to the underside of the bar so as to leave a three-inch space between them. The front end of each scoop has a gently rounded point, the better to penetrate the close-growing rice stalks. Behind the crosswise bar, the rear end of each scoop empties into a long metal trough that leads into the boat, where a canvas apron permits the operator

to rake the rice into sacks. Immediately in front of the crosswise bar are two smaller tubular bars, from which a set of hardwood pins about two and one-half feet long project forward, so that each pin lies directly above the three-inch space between each scoop. On top of the main support bar, and directly in the center, is mounted a small motor of the type used in lawnmowers. This is geared to a double crank, which in turn connects with the bars on either side holding the projecting wooden pins. When this motor is put in motion, each of these bars travels back and forth in a four-inch stroke that rapidly agitates the wooden pins over the space between the scoops.

As the outboard motor at the rear pushes the craft ahead, the upright stalks of rice slide between the advancing scoops. The wooden pins, striking against the rice stalks, cause the ripe rice heads to shower down on the scoops. In dry weather, gravity causes the rice grains to slide steadily back into the trough at the rear, where the operator with a nine-foot aluminum-handled rake continually pulls the rice into the boat as the harvester travels forward. By means of a small hydraulic hoist, the handle of which is set conveniently beside the operator, the entire harvesting-bar can be raised or lowered, according to the height of the rice stalks.

Parching the rice is now done by a system of engine-driven drums rotating over a low fire, and hulling by modern machinery replaces the old Indian method of "dancing the rice." To further improve the quality, the rice is passed over screens that take away broken rice and chaff, then hand-picked to remove ergot, a dangerous fungus growth sometimes found in rice.

Attempts to transplant wild rice to other lakes for ducks to feed on, as carried out by Ducks Unlimited of Canada, have been successful only where conditions were exactly right; but transplanting wild rice on a large commercial scale has not met with notable success. Even a slight alkalinity in the water will cause the plant to sicken and die. For planting purposes, the seed must not be allowed to dry out. As soon as the seed is gathered, it is placed in jute bags, not packed too tightly, and submerged in the lake until wanted. If the seed is to be shipped, it is drained for twenty-four hours before it begins its journey. As soon as the seed is received, it must be immersed in water, and any seeds that float should be thrown away. Seed to be sown in a marsh is simply broadcast from a canoe, about ten to twenty pounds per acre.

Wild rice fields in the Winnipeg area are administered by the Manitoba government, which collects fifteen percent of the cash value of the rice when the fields are located in accessible areas, and seven and a half percent of cash value when the rice is located in inaccessible areas where planes must be used to freight it out. The big wild rice crop in Manitoba came in 1952, when one million pounds of green rice were harvested.

Approximately 600,000 pounds of wild rice are gathered annually from northern Manitoba, where the finest rice beds are located. But only ten percent of the crop is consumed by Canadians, the other ninety percent being exported to United States—a price of $2.50 per pound is the deciding factor with the Canadian housewife!

As Indian families sit around their campfires munching great bowlfuls of wild rice at the end of the day's picking, they must surely smile in amusement at their white brother, who so efficiently industrialized their "menomin," and then priced himself out of the market!

SCREECH OWL AT THE WINDOW

The little screech owl sits to call
on the far side of the outer wall;
to him it is no stranger sits within—
he talks intimately as if to kin.

I look out into the night
and he looks in into the light;
he sees me sitting quietly to hear,
and seems to welcome such a listening ear.

Does he praise the soft September night?
Or does he humbly voice delight
at being there
to keen upon the pungent summer air?

Were he in, and were I out,
I would have as much to sing about.

August Derleth

Preservation of open spaces offers a

Challenge To Suburbia

PHOTOGRAPH BY GORDON HICKS

Allen H. Morgan, executive vice-president of the Massachusetts Audubon Society, finds some of his best camera hunting in swamps and marshes.

Little Cynthia Morgan stands on the shore of Heard's Pond in Wayland, Massachusetts, a favorite fishing place for Wayland youngsters. The woods in the background is a well known and much-studied birding area.

TODAY, urban sprawl threatens nearly every suburb in the United States. Each day of the year, some 3000 acres of American countryside are bulldozed away, most of them within easy driving distance of some big city. Farms, woods, and hillsides disappear to make room for housing developments. Marginal land is bought cheaply, filled with dump, and built up with factories. New highways and cloverleaf interchanges eat up thousands of acres of land, and establishments to serve the traveling public take still more.

How can a suburb save for future generations a few of the open spaces and natural areas that now make it an attractive place in which to live and bring up a family?

What is happening in the suburbs now is only a mild preview of future developments. At present, one American in six lives in a suburb. The Census Bureau estimates that, if our birthrate stays unchanged, there will be more than sixty-three million *more* of us by 1975. And it is expected that some thirty-eight million of the newcomers—almost two-thirds of them—will be added to the suburbs.

Government agencies worry about such aspects of urban sprawl as river pollution, flood control, and the slow ruin of fine cropland. They work also to save suburban land for ball fields, picnic grounds, and marinas. But, with few exceptions, they have not been interested in the problem of conserving natural land in the suburbs. Even in metropolitan New York, the bailiwick of dynamic Robert Moses, most of the recent rescues of unspoiled open spaces have been the work of dedicated individuals and small groups. The Mianus River Gorge was saved by a committee hastily organized just one step ahead of the bulldozer; the Bayard Cutting Arboretum was the superb memorial gift of a wealthy and public-spirited woman; and Herrontown Wood was given by a Princeton professor and his wife.

Then there is another way of saving suburban open spaces, not as painless as by handsome bequest nor as exhilarating as a last-minute battle. This is the slow, hard way of acquiring untouched suburban land now, while it is still available, in small tracts or large, and

By BARBARA B. PAINE

Photographs by the Author unless otherwise credited

without insisting that the acres saved be acres of distinction. Any natural land is worth saving, especially in the suburbs.

Among the most slowly growing metropolitan areas in the United States is that around the city of Boston, Massachusetts. Pressure on suburban land here is slight compared to that in exploding areas like Miami, Oklahoma City, Dallas, Los Angeles, and the San Francisco-Oakland region. But even in suburban Boston spaces vanish while town and regional planning boards think the problem over, hopefully wait to see what turns up, or have fine plans but find no money.

About ten years ago, a resident of Brookline, just over the line from Boston, willed to his town $250,000 for a town forest, and ten years ago land for a town forest could still be found in Brookline. The donor's heirs objected, the case dragged through the courts, and when it was settled last year in favor of the town the land was gone. Now Brookline will have to see its town forest outside the town's boundaries.

In the nearby suburb of Lincoln, important woodlands that could have been bought for about $60,000 a few years ago are worth more than $250,000 today. Lincoln is a fairly well-to-do suburb where $60,000 could have been raised, but a quarter of a million dollars is prohibitive.

While the people of Brookline waited for their gift to materialize, and the people of Lincoln allowed economics to take its course, a small group in Wayland, one of Boston's outer suburbs in the same westerly direction, got down to work. Their creation, Sudbury Valley Trustees, Inc., offers a fine model of a conservation program for private individuals to set up in any suburb. Their success has been outstanding. Since its founding in 1953, the Trustees have grown from the founding seven members and no land, to nearly 400 members and more than 400 important acres to be held in permanent trust. All conditions surrounding this achievement could be matched almost anywhere in the country.

Wayland itself is a typical outer suburb twenty miles from the heart of the big city. It has some farms, some factories, and plenty of new ranch houses. In the last twenty years, its population has grown from about 3300 to more than 8000. It is mainly a suburb of small homes occupied by people with moderate incomes. The town has an excellent planning board, but no funds for acquiring land.

In its physical aspects, of course, Wayland is as different from suburban Miami as both are from suburban Dallas. Because the town spreads over the floodplain of the Sudbury River, the great conservation challenge is saving wetlands. So the story of the Sudbury Valley Trustees must emphasize the acquisition of marshes and swamps with their accompanying woodlands. But the principles of the simple, workable program can be applied just as well to saving acres of woods, grassland, canyons, semi-tropical bayous, seashore, or any other kind of available land.

One Sunday afternoon in the summer of 1953 two Waylanders, Allen H. Morgan and his friend George K. Lewis, were chatting in the Lewis' backyard. For the hundredth time they agreed that it would be a good idea to save a few permanent open spaces for coming generations of Waylanders.

"We suddenly realized that we could talk forever without getting anywhere," said Mr. Morgan. "We decided to do something specific. Since the first step seemed to be a meeting of interested people, I went home and started telephoning."

Sudbury Valley Trustees, Inc., was founded by the seven men who came to that original meeting. Although Mr. Morgan is now executive vice-president of the Massachusetts Audubon Society, until 1957 even he had amateur status as a conservation worker, and earned his living in the insurance business. The rest had various professions and businesses, and no more political influence than the usual home owner. Their counterparts can be found in all suburbs.

It is worth noting that they represented four quite different points of view towards conservation, all of them important. Several had the conventional interest.

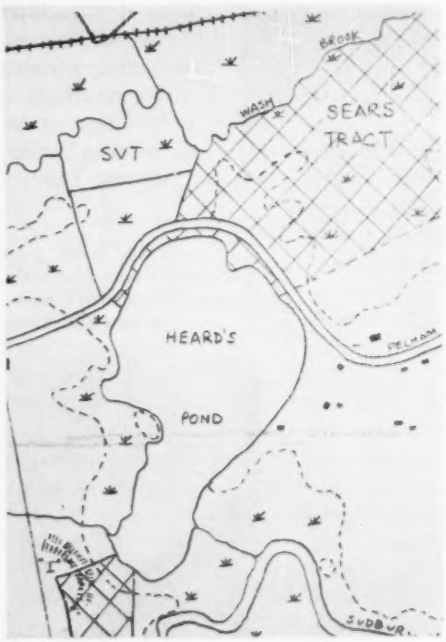
The bulldozer levels great tracts of suburban land every year, and close-packed housing units spring up like mushrooms. Will future occupants of homes like these in Wayland, Massachusetts, have open spaces in which to rest and play?

One was a sportsman and duck-hunter. Another raised chickens, experimented with fruit trees, and reflected the farmer's concern. And one man pitched in not because of any love of Nature but because he believed in keeping a few suburban amenities intact.

The name "Sudbury Valley Trustees" brings up another point: It was chosen by the founder because it covers every town in the watershed, about thirty in all, some being suburbs of Boston, some the suburbs of other cities, and one or two small cities themselves. The founders hope that, as their program succeeds in Wayland, volunteers from other towns in the watershed will be inspired to set up local units. (At present, two have almost reached the point.) Each may acquire land in its own town, and all will be partners working together for the watershed as a whole. The newcomer will be saved the tedious legal preliminaries.

In this expanded scheme every town will naturally provide its own hard work and money, and will tailor its program to fit local geography. Since Wayland, on the floodplain, is plagued in the spring by floods and in the summer by heavy demands on a shrinking supply of water, the founders have specialized on acquiring wetlands. Swamps and marshes act quite literally as vast blotters. By soaking up water when it is abundant and releasing it gradually during dry spells, wetlands both control floods and alleviate droughts. They abound also in wildlife. Mr. Morgan would love to see otters return to his home town.

Crude reality had to be considered, too. Wetlands are cheap and relatively easy to acquire, either by purchase or by gift. In their plannings the founders gave certain local wetlands high priority, especially those which protect the headwaters of small streams. "We would accept any gift of land in this area," said Mr. Morgan, "unless it looked like part of a tax-dodging scheme."



A section of a map in one of Sudbury Valley Trustees, Inc., bulletins is typical of the way members are kept informed. Dotted lines show wetlands likely to be flooded in spring. Tract marked "SVT" is already owned by Trustees, while "I" at lower left indicates an Indian site.

According to Mr. Morgan, you can not overestimate the importance of having a lawyer among the founders. Roger Stokey, the lawyer in this group, has done all the legal work as his contribution. "If we had needed to raise money to engage a lawyer before we even started," said Mr. Morgan, "we never could have done it."

Mr. Stokey's first act was to get a corporate charter for the Sudbury Valley Trustees from the State of Massachusetts. This came through in November, 1953, and the trusteeship was in business. Its first piece of land was acquired shortly thereafter—a swampy, eight-acre tract bought for ten dollars from the Boston Edison Company. In 1955, the U. S. Internal Revenue Service ruled that donations to the Trustees were deductible from net income like other gifts to non-commercial, charitable, and educational organizations. Nowdays, the most public-spirited citizen must consider the tax situation.

Another essential first step is the approval of government agencies. In western States, where the federal government may own up to seventy percent of all the land, such approval is fundamental. Even in the Sudbury Valley, with its small farms and single tiny United States wildlife refuge, the enthusiastic support of United States Soil Conservation Service engineers has been important.

For the first year or so, the program of the Trustees made slow progress. Conservation-minded people believe in saving open spaces for the future, but a much wider base is needed. In selling wetlands to the public, the Trustees had an exceptionally hard job to do. The only appeal that swamps have for much of the general public is the question as to how soon they can be drained and filled. So the people of Wayland first had to be taught that swamps, not culverts and drain pipes, control floods, and then aroused to the point of giving money, or land. The founders and their recruits have held meetings, led walks, and sent out many bulletins that tell the members what is happening, and remind them of its importance. Most of the bulletins are illustrated with maps, pictures, and aerial photographs, and contain such items as where to get a free nesting-box for wood ducks.

The publicity of the Trustees appeals to as many interests and self-interests as possible. The profit motive is used with businessmen whose factories are flooded in the spring and farmers who need water for irrigation in the summer. The average commuter, who often enjoys his own bird-feeding station but would not dream of paying five dollars a year to join the Audubon Society, still can be interested in preserving the amenities of his suburb. He moved to the country because he found it peaceful and pleasant, and so that his children could have room to run around. He is willing (with a little delicate prodding) to do his bit towards saving something for the next generation. The approach most likely to succeed, in Mr. Morgan's experience, is through the children—Scouts, Campfire

A floodplain at work. This woodland, under two feet of water, is acting as a reservoir for the future. It is thus a natural flood control area.

The aerial photograph below shows, at one end of Heard's Pond and its surrounding woods, the floodplain of Wash Brook, which flows into the Sudbury River. The Trustees now own some of the floodplain and most of the woods.

Girls and 4-H Clubs, and Parent-Teachers Association.

Even the short-sighted, less country-minded commuter realizes that a rural atmosphere has a cash value. The word has spread from suburbs with exploding populations and no effective zoning laws that all those new ranch-type houses mean higher taxes for everybody.

The success of the Trustees' fight for public backing was shown in Wayland by the main event of 1956, a first money-raising campaign. A real estate developer with fourteen houses in mind bought thirty-four acres of mixed woods and swamp at the headwaters of a nice little brook, exactly the kind of area the Trustees intended to protect. To save it, they sent out two letters of appeal about six weeks apart, and raised $7500 with no more ado than that.

In January, 1958, the Trustees began a campaign for $12,500 in order to buy two larger tracts. But Wayland is not a rich suburb. As this is being written, enough money has been raised only for the Heard's Pond area, the more important of the two, and a well-known wildlife habitat. The second piece of land includes the site of an old Indian village. Mr. Morgan, who is most ingenious about including many points of view, hopes to interest the archeologically minded.

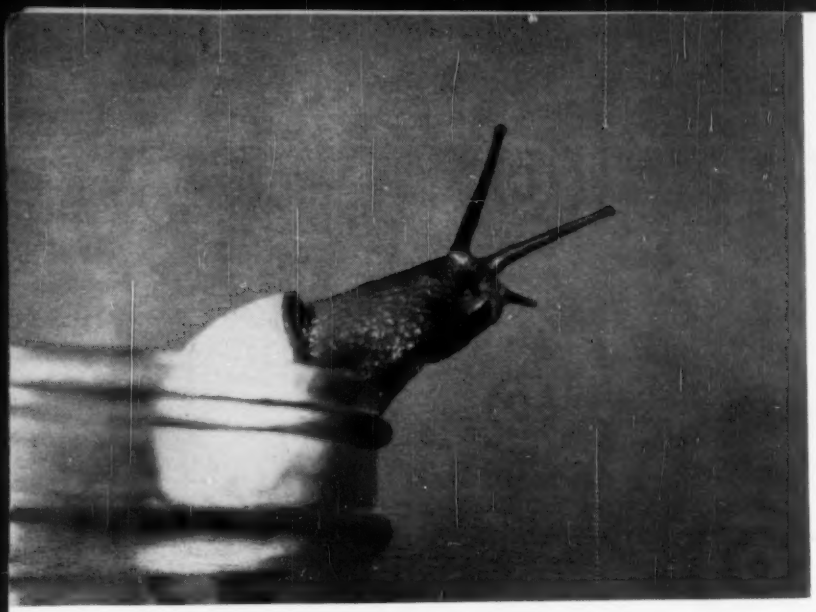
Wayland landowners have been generous, but getting them to give, or to sell for a nominal price, even marginal land like swamps, takes a lot of time. You call on a public-spirited citizen around Christmas, Mr. Morgan said, and put the idea in his head. About the Fourth of July, you make another visit to see how the idea is coming along and to add more persuasion. The legal angles of some gifts are complicated. People can give land in such a way that their eventual heirs will not lose one penny because of their generosity. Arranging for this takes time, too. Once in a while an unexpected gift arrives. Just recently the lawyer of a Wayland family telephoned Mr. Morgan and said that his clients had decided to turn over to the Trustees fifty acres. Other gifts have been contingent on successful money-raising first.

One of Mr. Morgan's favorite statements is: "What we save in the next few years is all that will ever be saved. A suburban open space does not have to be glamorous or unique to be worth saving. Any unspoiled natural area in any suburb is threatened today and will be spoiled tomorrow unless someone starts fighting for it right now." While the members of the Sudbury Valley Trustees have not rescued any redwood forest primeval or famous barrier beach, they *have* saved, as a beginning, four hundred irreplaceable acres in one small suburb under conditions that can be duplicated in nearly all other suburbs.

BEETLE AND MUSHROOM

A yellow parasol gives pleasing shade
To rajah clad in black and red brocade.

Eddie W. Wilson



"Fat Boy" Was A Liguus

The author was intrigued by the set of eyes that looked like "rabbit ears" on a TV.

Chokoloskee Island is located on the farthest southwestern point of Florida that is now accessible by roads. Early in 1956, a road was completed from Everglades City to the island, almost the entire 150 acres of which is literally an Indian shell-mound. One of the numerous mounds rises to a height of twenty feet. The island is sparsely populated with trees, but the ones on which the tree snails of the genus *Liguus* thrive are gumbo limbo, sugar apple, chicken-berry or wild olive, and wild dogwood. But with clearings for roads, motels and fishing camps the few remaining trees probably will be removed and the beautiful snails in this locality become extinct.

It was dusk on the island. The sun had set, and the sky was splashed with various hues of lavenders, rosy pinks, and shades of orange. But, for once, I was not interested in the display, for I was working against time hunting tree snails of the genus *Liguus*, found only in the lower hammocks of Florida, in Haiti and Cuba. Earlier in the afternoon I had found a few dead shells on the ground.

A boy of about seven happened by, and asked what I was looking for. I told him, and a few minutes later he shouted: "I found one, I found one."

Hastening to him, I was disappointed to discover that it was only a young *Liguus*. However, I thanked the youngster, gave him five cents, and carefully dislodged a small branch of the low-hanging tree on which the live snail was hibernating. It was by then too dark to hunt further.

The baby *Liguus* was placed in a paper sack, along with some dead specimens that had been gathered earlier. I completely forgot about it until two months later, at home, where I was cleaning some specimens in the hope of improving their appearance. Only mollusks taken in the live state, and then removed, are worth keeping. The shells lose their lovely coloring if the animal dies and the shell is left to the elements for any length of time.

The photograph, taken through the glass of a bowl, shows how snails often like to sleep touching each other.

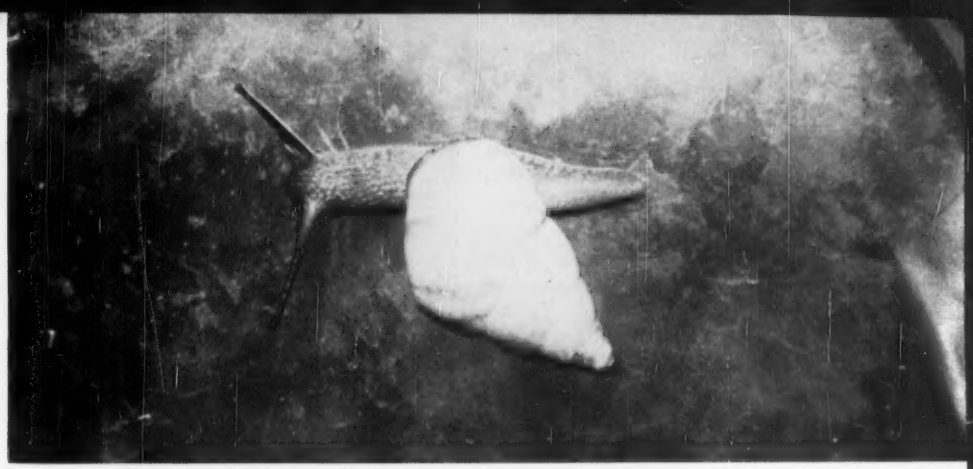
For some reason, I did not attempt to remove the occupant or clean the shell of the baby *Liguus*, although I knew that it was no longer hibernating, and had withdrawn considerably into its shell. However, as there was no unpleasant odor, I again completely forgot about it until, a few days later, I found a rather strange-looking worm crawling among the shells on my desk. Catching this worm, I felt both delight and perplexity—delight at finding it was the baby *Liguus*, alive and apparently all right after living in a paper sack for more than

By

ROSEMARY

CLARKE

Photographs by the Author

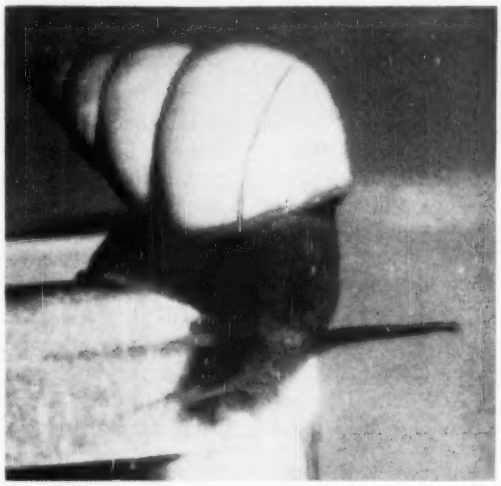


The experts agreed that it would be impossible to keep *Liguus* alive in captivity.

two months; and perplexity as to what to do with it.

As the animal had survived on its own, I was intrigued by it, especially the charm of its wiggling eyes—eyes that looked like rabbit ears on a TV set. Not knowing that it was "impossible" to raise *Liguus* in captivity, I decided to experiment. The snail was placed in a waterless goldfish bowl. I moistened the sides, and put some lettuce on the bottom.

As I knew nothing about a snail's diet, or its proper housing, I sought the advice of *Liguus* experts. They offered many helpful suggestions; one even said to place the snail on a tree outdoors, with a wire screen as protection against birds. The consensus, however, was that all other attempts to raise *Liguus* in captivity had failed, and that I, too, would be unsuccessful. One learned gentleman said that this kind of snail would not eat lettuce or other leafy material, as its teeth differ from those of leaf-eating snails. This was quite true, for *Liguus* scrape for their food.



"Fat Boy" peers over the side of "his" home, a goldfish bowl without water.

But either my baby *Liguus* forgot that it was a tree snail, or else it was so hungry it started eating soon after being exposed to food. Its first meal was of lettuce. The snail sat on the lettuce for more than four hours, and scraped and scraped until it made a hole. The hole became larger and larger until the *Liguus* was fully satisfied. Next, I tried such foods as cabbage, banana, apple, malted milk—which had been reported successful for a few months—cheese, the bark and leaves from citrus trees, and a fern, *Polypodium polypodioides*. The latter two my snail loved, but it also enjoyed lettuce and cabbage. It liked the malted milk only once or twice a week. When placed on a piece of cheese, the snail tasted it in several places and then looked up to me as if to say, "I can not eat this!"

It has been difficult to raise *Liguus* in captivity because the natural food of these animals is not readily available away from the hammocks. Each hammock has its own kind of tree snail, which is rarely found in other hammocks. Shifting a *Liguus* from one species of tree to another is said to doom the creature.

Liguus follows a methodical, well-ordered existence. Upon waking at about the same time each evening—snails are usually night-feeders—the *Liguus* cleans its shell quite thoroughly before hunting food. Hanging on the glass of its bowl by its roundish foot, approximately the size of the aperture of the shell, the snail, without moving the foot, comes out and scrapes on the shell with its radula. This is a ribbon-like organ common to all gastropoda. It often assumes the shape of a coiled watchspring, with which the snail scrapes, tears, or bores for food. There is one central tooth, with an even number of others on each side. These may vary from 110 to 152, or more, in *Liguus*.

The scraping process takes from twenty to forty-five minutes as the *Liguus* gradually turns the shell, and its body is contorted as it scrapes all the way down to the apex. Tree snails hang with the apex in a downward position.

Soon after "Fat Boy," the name and sex arbitrarily given the *Liguus*, started eating, he apparently filled his stomach to more than its capacity, for he kept part of his body outside of his shell when sleeping. This condition of over-indulgence seems to be common only to *Liguus*. (I have been given others of these snails, and they did the same.) All did not progress well with Fat Boy from the day he started eating.

Returning home about ten one evening, I found Fat Boy partly out of his shell, lying on his back in about a half-inch of water. I thought that I must have care-

lessly placed too much water on the sides of the bowl in cleaning, or that it had come from the dampened lettuce. I rescued Fat Boy, recleaned the bowl, replaced the snail, and waited. After an anxious interim, the *Liguus* came completely out of the shell and started looking for food.

Once I forgot to replace the wire screening on the top of the bowl, and Fat Boy escaped. The next day I hunted until I found him on a high book shelf, asleep, and fastened to a book entitled *The Sojourner*.

Land snails usually have an epidermis or outer covering on the shell. This serves as a protection, and colorings vary from light tan and horn-color through all shades of brown and black. But the *Liguus* does not need an epidermis, living in the ground, and each species or sub-species receives its name from the brilliantly colorful patterns on the shell. When a *Liguus* sleeps, or is hibernating, the shell is somewhat drab in comparison with that of its wakeful hours, when it takes on a shining lustre. The latter is due to the secretion of a watery fluid coming from the collar of the animal. This is necessary for its existence. The collar is that portion of the animal which forms a protective blanket between the snail and the shell. When the snail is out, the collar becomes the mantle, or outer edge surrounding the elongated foot.

Upon awakening, *Liguus* cleans its shell quite thoroughly before searching for food.

Fat Boy has five and one-half whorls to his shell. When awake, two and one-half of these are a deep pink at the apex, the next two are an orange, and the body whorl or large whorl is off-white, with three pink stripes.

Soon after eating commenced Fat Boy started the growth of his shell. At first, the new growth was the same color as the skin, dark tan or brown. After reaching the necessary size, the shell gradually turned to the normal shell coloring. Even after adding to his house, Fat Boy continued to over-indulge, and spent most of his sleeping time partly extended.

Apparently, a *Liguus* adds to the shell only in the spring of the year, for Fat Boy, although exhibiting at all times a voracious appetite, did not enlarge his body whorl further. This appears to be also true of my other more recently acquired *Liguus*.

In some marine families of mollusca the animal will indicate rest periods in shell building by periodic thickenings of the lip. Although a *Liguus* shell always has a thin lip, long rest periods are often shown by a darkened vertical mark.

According to the literature on gastropoda, snails will go into hibernation either at the first cool weather in the fall, or during dry spells at any season. Therefore, in the latter part of November, when the temperature dropped, all of my tree and land snails commenced hibernating. All, that is, except Fat Boy, who could not completely enter his shell. I decided he must reduce, or eventually freeze. So, reluctantly, I removed all food and water from his bowl. In four days he was capable of completely entering his shell. Then he secreted the epiphragm, or membranous transparent covering, that sealed him in.

As the weather became colder—although the room in which he lived was kept warm—he made other partitions, and retreated farther into his shell. As is usually customary in Florida, the cool spells last only for a short period, and all my snails accordingly alternated between activity and hibernation during the winter. All, that is, except Fat Boy, who remained sealed within his shell.

Around the middle of January I decided to force his wakening. If a *Liguus* is removed from a tree during hibernation he may die, for the epiphragm is so strongly adhered to the tree that the shell often breaks. So I was particularly careful, and first tried a few drops of warm water on Fat Boy. The amount was gradually increased until his bowl was placed under the kitchen faucet with the water running full blast. He was still glued quite securely. After several more dousings, he must have felt the warmth of the water. There was a tiny movement. Exactly one and one-half hours later, he emerged in the same condition in which he had commenced hibernation.

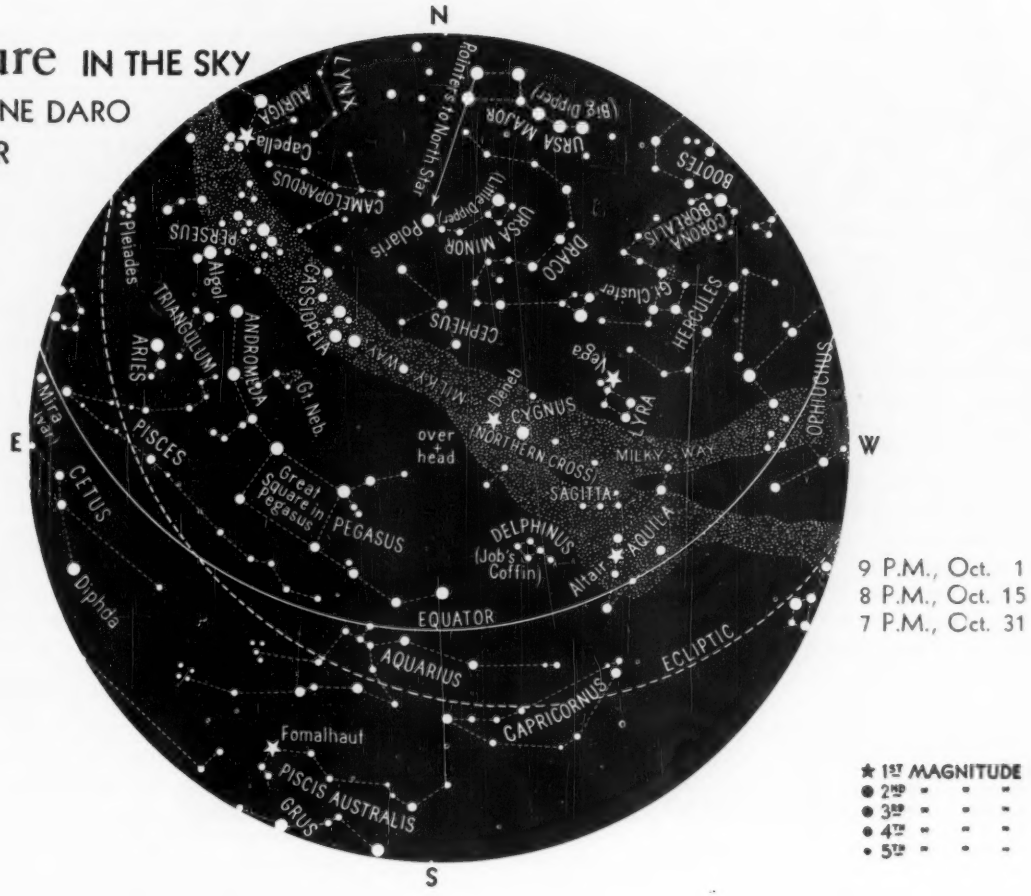
A variety of food was placed for his enjoyment, but apparently he was in no mood for eating, and the next morning I found him hibernating again.

It has now been two years and six months since Fat Boy was removed from the tree in Chokoloskee, and he is still alive and quite healthy. We have been through three winter hibernations and three spring awakenings; and although the time for commencement of hibernation varies slightly from year to year, Fat Boy always has been the most reluctant of my snails to begin the long winter sleep, preferring to eat rather than sleep. During this time Fat Boy has increased the body whorl of his shell by one and three-eighths inches, the largest growth occurring during the second year.

Recently I discovered that Fat Boy is a hermaphrodite, for this year he laid eggs. One day I discovered the snail with an egg in its mouth, hovering near the clutch as though anticipating more. Hastily, I separated Fat Boy from the eggs and carefully covered them with a little soil. How many he had consumed I do not know—there were about nine left—but I anticipate the hatching of the children. Fat Boy, like other snails, has completely forgotten the family, and continues to alternately over-indulge and sleep. Bringing up Fat Boy has been fun, and, in addition to the enjoyment, I can truthfully say that I now know the real meaning of the expression "a snail's pace!"

Nature IN THE SKY

By SIMONE DARO GOSSNER



To use this map hold it before you in a vertical position and turn it until the direction of the compass that you wish to face is at the bottom. Then, below the center of the map, which is the point overhead, will be seen the constellations visible in that part of the heavens. Times given are for Local Standard Time.

What's What in the Sun

One of the important undertakings of the current International Geophysical Year is a systematic and concentrated effort to observe the sun, its surface, its radiation, and its effects on terrestrial phenomena. Many press releases on the subject have appeared in American newspapers. Unfortunately, the scientific terms used to describe various features of the sun are usually not familiar to the non-astronomer, making it difficult for the casual reader to understand the nature of the observations. This article proposes to remedy the situation as far as possible by offering a small glossary of solar terms.

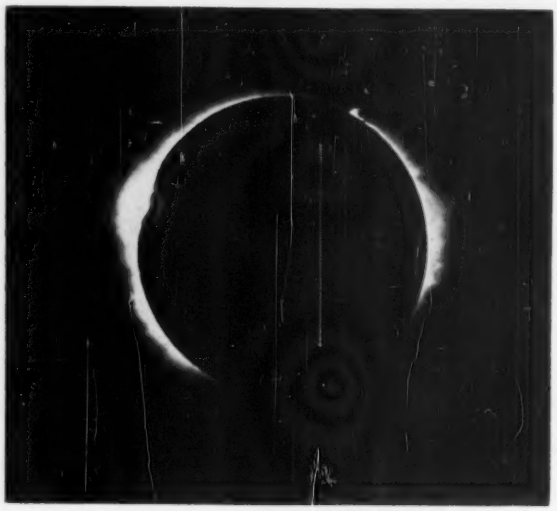
The visual part of the sun, familiar to everyone, is called the *photosphere*, from the Greek "sphere of light." Although the whole sun is gaseous, the hot gases in the photosphere are so dense that we cannot see through them to the center of the sun. The brightness of the photosphere falls off toward the edges, which are only about one-third as bright as the center of the disc. This *darkening of the limb* is much more noticeable on photographs than it is to the naked eye.

During total solar eclipses, when the photosphere is hidden by the moon, the *chromosphere* and the *corona* become visible. The chromosphere may be considered as the upper atmosphere of the sun. It derives its name from the Greek "sphere of colors," because of the bright red color which is due to glowing hydrogen. The lower part of the chromosphere often has been called the *reversing layer*. This is the region of the sun where the solar spectrum changes from the dark line spectrum of the photosphere to a bright line spectrum. The latter was originally seen only during the few seconds it took

the moon to cover the chromosphere during a solar eclipse. Accordingly, it was given the name of *flash spectrum*. The reversing layer has no definite boundaries, and is no longer considered a separate entity in the sun. The upper chromosphere is thought to extend perhaps as high as 8500 miles above the photosphere.

The *corona* is the faint halo of greenish-white light that surrounds the sun beyond the chromosphere. There is a sharp decrease in brightness within the corona, which leads to the distinction between the inner corona and the much fainter outer corona. The latter is so faint that it can only be observed during a solar eclipse. Even then, the light from the inner corona must be shielded in some way. The solar corona is a mixture of rarified gases and tiny dust particles.

The dust particles merely reflect the light from the photosphere. They give the corona its pearly-white appearance, and are said to constitute the *white corona*. The gases, on the other hand, give off light of their own, much of which is greenish. The true composition of the gases in the corona remained unexplained until 1942. Scientists were so baffled by the presence of unknown lines in the coronal spectrum that they tentatively attributed them to an element they named "coronium," which, supposedly, had no counterpart on earth. In 1942, however, the Swedish astro-physicist Edlén showed conclusively that the peculiar coronal spectrum was due to the presence of highly ionized atoms of known elements, principally iron, nickel, and calcium. "Coronium," after all, had been only a figment of the scientists' imagination.



OFFICIAL U. S. NAVY PHOTOGRAPH

The chromosphere and prominences of the sun during the eclipse of June 8, 1937, at Canton Island in the Pacific Ocean.

A further extension of the coronal dust cloud gives rise to the phenomenon of the *zodiacal light* (see *Nature Magazine* for April, 1956).

The chromosphere and the inner corona also may be observed outside of solar eclipses by means of a special telescope called a coronagraph. The principle of this instrument is to create an artificial eclipse by interposing an opaque disc at the focus of the telescope in order to obliterate the light from the photosphere.

One of the major uses of the coronagraph is the observation of *prominences*. These are huge streamers of reddish gas (mostly hydrogen) that appear to surge from the surface of the photosphere into the chromosphere, and often far into the corona. They present many shapes. In time-lapse photography, they are seen to develop into long threads, or arches. Although they are luminous when viewed at the edge of the sun, they take the appearance of dark *filaments* when seen against the background of the photosphere. They are usually associated with *sunspots*, an account of which appeared in *Nature Magazine* for May, 1956.

The spectacle of solar prominences viewed with a coronagraph is so striking that it was chosen as the subject of the U. S. postage stamp released in the spring of 1958 in commemoration of the International Geophysical Year.

Another phenomenon of the chromosphere is the sudden *flare*. This abrupt increase of luminous intensity occurs in the vicinity of sunspots. Unlike prominences, this is a burst of light, not an eruption of matter. Flares are short-lived and frequent. During periods of great solar activity, they may occur at an average rate of twelve per day. They are relatively difficult to observe in detail because of their short duration, and because they tend to appear unexpectedly. The appearance of a flare often coincides with sudden disturbances in the earth's ionosphere and magnetic field. It is strongly suspected that flares are responsible for such disturbances. It has been found that flares emit radiation in the range of radio-frequencies, and there is also convincing observational evidence that a flare will cause a temporary increase in the intensity of the cosmic rays produced by the sun.

In the month of October, the New Moon will occur on October 12, and the moon will be full on October 27.

Mercury will enter the evening sky on October 5. It will be too close to the sun, and thus poorly placed for observation all month.

Venus, in Virgo, will rise in the morning, about one hour before the sun on October 1, one-half hour before the sun on October 15. By the end of October, it will be lost in the glare of sunlight. Low over the eastern horizon, it will be difficult to observe.

Mars, located in Taurus between the Pleiades and Aldebaran, will rise at about 8 p.m. on October 1, 7 p.m. on October 15, 6 p.m. on October 31, and will remain visible throughout the night. Rising in the east, it will pass high in the southern sky in early morning. By the end of October, it will be in the western sky by sunrise. Steadily approaching the earth, with its southern hemisphere tilted toward us, it will (*Continued on page 445*)

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In Reverse

Colorado cattlemen, according to *Outdoor Life*, have posted 200,000 acres of land on which there is to be no hunting, trapping or poisoning of coyotes. So successful had extermination campaigns been that predatory birds, weasels and other predators had disappeared along with the coyote. As a result, rodents multiplied and ate up more than thirty percent of the range grass at a loss of more than three million dollars, making predatory animal extermination doubly expensive.

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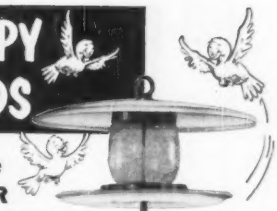
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Nature IN THE SCHOOL

BY E. LAURENCE PALMER

Professor Emeritus of Nature and Science Education, Cornell University, and Director of Nature Education, The American Nature Association

Rosemary

Rosemary Rules the Waves

I HAVE only just returned from three weeks in London, where Mrs. Palmer and I attended the meetings of the International Congress of Zoology. In another four weeks, Russia willing, we shall be off to the Middle (or Muddle) East and Greece to attend the meetings of the International Union for the Conservation of Nature. This is my report to you on the London and England trip. The other will be reported at a later date.

Previously we had attended the Zoological Congress in Copenhagen a few years ago so we had some experience to give us perspective, and had made acquaintances that we enjoyed renewing. Also we had been in England before, so could observe post-war changes. All told the experience was a most gratifying one and gave us faith that, given reasonable peace, we may be optimistic about the future personally, politically and professionally. Of course, also, we had a background of many similar meetings in America. We feel that the experience in England was worth the cost in time, money and effort. We know that we attended to business more seriously than did some of our fellow countrymen who received generous subsidies to attend.

Many fine papers

Approximately 500 papers on zoology were read at the Zoological Congress. We did not hear them all, could not have understood many of them, and thoroughly enjoyed a few. Some were outstandingly interesting.

In a section on Animal Behavior, I think I saw the presentation that most interested me. E. A. R. Fabricius of Stockholm gave an exceptional paper on "Visual Stimuli Releasing Nest-digging Movements in Spawning Female Salmonids." The photography was spectacularly good. As a result of the paper, I came away with some convictions rather diametrically opposed to those I had before I went into the meeting, and I think that I appreciated more than ever before that the making of generalizations based on inadequate data is a most dangerous procedure. Fabricius placed a piece of plate glass over his trout nests, making it possible for the fish to see the bottom but not to touch it or get odors from the partially completed nest and egg deposit. Someday someone should write for Nature teachers a book on ways to make animals behave the way you wish them to do, and tell what can be learned about animals by experiments that govern their behavior. Ruth Crosbie Noble's *The Nature of the Beast*, commented on before in these columns, approaches the idea I have in mind. Shortly after hearing the Fabricius talk, I picked up, in a nearby bookstore, *The Love-Life of Animals* by Wolfgang von Buddenbrock. It was tremendously interesting and not as depraved as its title might suggest or as its jacket might indicate. An inadequate index limits its usefulness somewhat. I only wish that I had regular access to those bookstores near the British Museum of Natural History. They supply every need.

In a section devoted to conservation of Nature, Harold Coolidge of Washington, D. C., did a good job showing, with others, the importance not only of knowledge of zoological subjects but the value of concern about some of the important conditions governing the survival of vanishing species. Most interesting was his statement about how a tiger assisted in the protection of some vanishing wild cattle by killing a collector who might otherwise have exterminated a species. The tiger's act frightened other collectors away during what might have been a critical period for the survival of a species. The movies of the expedition to which he referred were excellent, but could not be given with the paper because of the time element.

Zoological nomenclature

For more than one week we did little beside center our interests in a colloquium on zoological nomenclature. Presentation of the details here would hardly be appropriate, but the meeting of more than a hundred zoologists interested in nomenclature, and their attempt to reach an agreement in their particular field, was most enlightening. Since this was our second experience with this colloquium, I think we can report that the group seems to be making definite progress in reaching agreements, despite language, racial and national interests that might conflict. To us, it was particularly interesting to renew our acquaintance with the Russian delegates.

Some may remember my reporting on the field trips of these and of other organizations. Some fifty of us, including Chinese, Japanese, Germans, Italians, French, Russians, English, Americans and others, took an all-day trip to some famous fossil collecting sites. I question if it was as necessary to go so far for a satisfactory experience, but that was true of the Denmark experience, too, and I am sure it is typical of much that happens here at home. I returned to Ithaca to find a class taking a two-hundred-mile trip to find less than could have been found, with some care, possibly within two hundred yards of their home classroom.

In our trips around England during the last week, we were impressed with the fact that English streams seem to be much less polluted than their American counter-

parts. We may be wrong in this but we had that impression driven in on us. When we saw a fresh, clean stream flowing under a bridge that connected two parts of a highway built by the Romans we wondered if we can be wholly proud of what we have done with our natural environment in the last century here in America.

Life improved

We were most gratified to notice the improvements in English life in the recent few years. Restaurants were cleaner. Food was better. People were better dressed. We saw no unfortunates sleeping under newspaper blankets in the public parks. It was gratifying to have the opportunity of watching a mother gallinule care for her young within sight of Buckingham Palace. Each morning as I woke and looked out my window I saw a cornice in a building across the street that had been wrecked by a German bomb but the signs of war are fewer.

As is usual I was impressed by the discipline imposed at an early date on English youngsters. The museums were full of groups of youngsters proceeding in an orderly manner to profit by the excellent exhibits available to them. The youngsters did not lack the drive to have a wonderful time, but they also understood the "rules of the road" better than seems to me to be the case with some American junior groups. Maybe it is the uniforms that English youngsters wear that help them conform, but I spent a number of hours listening to them in a few science museums and I am sure that they were on their intellectual toes. I met one 11-year-old boy whose mother used to be on my kids' radio program regularly. She married the leader of a jet bomber squadron and a month after two of her three sons were born was a widow. The boy had an avid interest in almost everything and limitless physical energy, judging from his behavior during the two days I observed him. We have every conviction that Christopher will live up to the ideals for which his father died, and we were interested in the fact that, while he wanted to become a squadron leader in the British air force like his dad, he does not want either of his brothers to go into that work.

Meets the people

I made up my mind to try to mingle with the average Briton and British technical leaders; with young and old. I finally selected a bench in a park next to the British Museum. One day I sat there with mingled emotions watching a group of "Bohemian" sculptors set up a remarkable exhibit of their work. I had about decided that a seven-foot representation of a walking man was a little better than one of a falling man, and infinitely better than "The Dream of a Pregnant Woman." I had become bored with watching a dirty, bearded youth let an attractive young woman do the heavy work of setting up a unit when a small voice off my "starboard quarter" asked me if I "liked birds." It was then that I met Rosemary, an eight-year-old with long blond braids. I indicated to her that I did like birds, so she scouted around, found some crusts and together we fed the pigeons. From pigeons it went on to ladybird beetles, aphids, earthworm casts, plane trees and a host of other things in Nature that both of us seemed to like. Given some encouragement she should some day be a famous collector for the British Museum, which is across the street from her home. She was tireless in her activity, had an excellent memory, was considerate of the feelings of all animals, large and small, but not too widely experienced in world affairs. She knew of one American town, Maxwell House, where, she understood, they made some famous drink. I think she still considers it our most famous community.

For five successive days, I met Rosemary on that park bench at five in the afternoon. I even met her mother the second afternoon, but she lacked the drive and imagination of her daughter. I rather suspect that I am about old enough to be her mother's grandfather. But Rosemary—there was someone worth knowing, and fortunately there are Rosemarys all over the world. Maybe they will be able to bring us to our senses with their "finds" of ladybird beetles that crawl around your neck and eat aphids as you watch them. True we had a wonderful experience in England at the meeting of the International Zoological Congress, but for me Rosemary rules the waves. She and her kind may some day solve the problems that worry us. I hope that she has the chance. I think she will. Next month, I shall seek her counterpart in Athens, Greece.

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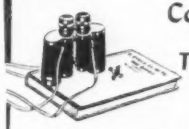

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THE Nature CAMERA

By EDNA HOFFMAN EVANS

Alpha and Omega

IT IS STRANGE HOW SOMETHING that happens regularly every day can be so elusive. Sunrise and sunset, for example. They are phenomena that have been occurring daily ever since time began on Earth. But how many really good photographs have you seen of a sunrise or a sunset? Not a great many, I am willing to wager.

Like almost everyone else, I have been taking sunrises and sunsets for granted until fairly recently, when I decided I wanted some pictures of them. That is when I began noticing how elusive they really can be.

In all honesty I must admit that I have pursued the sunsets, with photographic intent, much more avidly than I have the sunrises. There is no doubt in my mind that sunrise is a beautiful and inspiring time of day. It just happens too early to suit my rising habits. By sunset time, I have been up and in full possession of my faculties for a long time. But I cannot say the same for sunrise.

Unexpectedly, I saw a beautiful sunrise recently—the whole eastern sky was a glorious rose color. But when I opened my eyes at about 5:30 a.m. (such an early awakening for me is quite unusual) the wonderful spectacle was already in full progress. My camera was neatly stored in gadget bag, the setting outside my window did not lend itself well to this type of photography, and by the time it would have taken to get everything ready, the pageant of dawn would have been over. So all I could do was sit and admire, and then climb back into bed for another forty winks or so before beginning the activities of the day.

Some prefer sunsets

Until they are almost ready to begin, spectacular sunrises and sunsets are not predictable—at least I cannot predict them. One could, if he were able to count on cosmic cooperation, be up before dawn, with proper foreground chosen and camera set. Then, as the rosy-fingered dawn (to borrow a classical expression) stole over the horizon, the phenomenon could be recorded. But far be it from me to get up *that* early, on a gamble. The sun would rise, of course, but how could I be sure of proper cloud effects and unusually brilliant colors? No, I will take my chances with the sunset. At least I will not lose any beauty sleep that way!

Sunsets can be mighty disappointing, as I have found since I began wanting to photograph them. At the beach, recently, I watched the sun sink into the Gulf of Mexico with scarcely any fanfare whatsoever. And there I was, light meter ready, camera on tripod, cable release in hand, waiting behind a cluster of palm trees that would make attractive silhouettes in the middle foreground. So, what happened? Nothing. There was not a cloud in the western sky, no wisp of haze to catch and hold the rays, nothing, really, to photograph.

Not all beach sunsets are that way, of course. In my day I have seen some magnificent ones, scenes that changed from one glory to another for endless minutes as the sun made its majestic descent down the western sky. Such displays usually have occurred when I had no camera handy.

Photogenic sunsets, I think, are more easily anticipated than sunrises. As sunset time draws near, you usually can tell whether or not there is going to be a spectacular display. If there are clouds in the west—not a heavy overcast, but nice, light, roly-poly clouds compactly arranged and yet with enough spaces between them for the sun's rays to peek through, particularly when the clouds are some distance above the horizon, from fifteen to thirty-five degrees, you can expect something in the way of a colorful sunset.

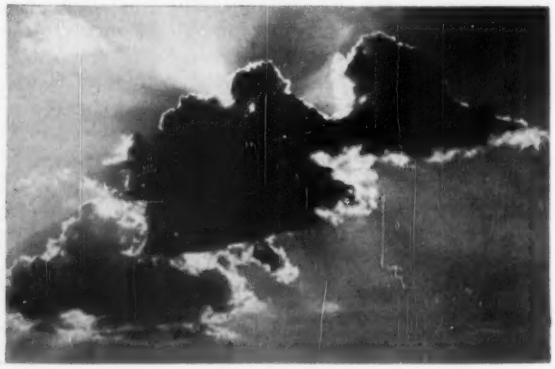
Finding the setting

Begin your vigil about a half hour before sunset (the local newspaper usually gives the time for both sunrise and sunset) and with practice you can tell whether there will be sky colors or not. If the prospects look promising, gather up your photographic equipment and find a good setting.

The setting may be selected ahead of time—and should be, in fact. There will not be much time to hunt, once the sunset pageant begins. I like water in my sunset settings; in that way the reflection gives a double rendition of color. Whatever divides the earth from the sky will appear as a dark silhouette,

The sea oat stalks in this sunset shot make a pleasing silhouette, and break the straight line of the horizon.

The sun works best as a camera subject when it is behind the scenes. Clouds perform as the actors "out front."



A palm set-up like this gives a good sunset silhouette. In this shot the palms are unduly centered, but were so placed because of the cloud bank behind them.

so it should be pleasing in form. Trees make good silhouettes—any kind of trees. Palms, of course, give a flavor of the tropics, and sharply pointed pines bespeak the north woods; but any kind of tree will do. Other plants will do, too, and so will a city skyline, if it is a pleasingly varied mass. The silhouette can be solid, or there can be broken spaces in it to let more of the sunset shine through.

Exposures for either sunrises or sunsets pose something of a problem. It makes a big difference, of course, whether you are using black-and-white film or color. Sunsets may be recorded in black-and-white with beautiful and spectacular results; but, to my way of thinking, only color film can do them justice. Thus, I am going to give more space here to color photography techniques.

Light values at sunrise and at sunset are extremely deceiving. They look bright; but are they? An exposure meter reading usually records them in the very low ranges, requiring more time than the usual daytime picture. With daylight-type Kodachrome film, a good combination is a shutter speed of 1/50 second at f/4. With daylight Kodacolor, under the same conditions, the recommendation is 1/50 at f/5.6, and with Ektachrome it is 1/50 at f/7. Regular Anscochrome, with the same speed rating as Ektachrome, should be used similarly. I do not think the high speed Ansco color film would be very suitable for these subjects. Black-and-white films, with their varying speeds, are best calculated with the help of a light meter.

Colorful afterglow

After the sun has dropped below the horizon, the afterglow is often even more colorful, but the light resulting from it is considerably less. Exposures drop to 1/25 or 1/10 at f/2 with Kodachrome, 1/10 at f/4.5 with Kodacolor, and 1/10 at f/3.5 or 1/5 at f/5 with Ektachrome. It is well to set your camera on a tripod, or some other substantial resting place. You are not going to shoot and run, in any case, and with speeds under 1/25 hand-held shooting is not successful.

In describing the progress of a sunset, I have used the word "pageant" several times. I have done so intentionally. According to the dictionary, a pageant is a series of elaborate and spectacular displays usually given outdoors, and certainly a sunset fulfills those specifications.

A sunset is not just one scene; instead, it is a series of episodes using the same actors (clouds) with the action moving smoothly from one setting to the next. For that reason, it is difficult to take just one picture of any given sunset or sunrise. The display begins as the sun approaches the horizon (either going down or coming up) and continues until the orb of day has ascended into the morning sky, or has disappeared from sight below the horizon. The sunrise display usually ends with the emergence of the chief character; sunset continues until the last color has faded from the western sky.

The most photographable sunsets—and the same applies to sunrises—are those in which the sun itself does not appear too strongly. Conditions are best, photowise, when the sun is almost or entirely obscured by clouds, haze, smoke, mist, dust, or a combination of these. Its full glare is too much for the sensitivity of film. The result is overexposure, or a blob of light and nothing more. The sun works best as a camera subject when it is behind the scenes, with its rays shining through or around the obstructions that produce spectacular colors.

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Since I have been hunting sunsets, I have begun to wonder whether they are better at any particular time of year, or in any given section of the country. Autumn, perhaps, is a slightly better time for photographic effects. The dust or haze in the air is apt to be more pronounced then, while spring and summer rains tend to wash the air clean, and winter skies often reflect the general coldness of the weather. As for geographic location, I have seen magnificent reds and golds, as well as soft yellows and mauves, over the southwestern desert country; I have seen breathtakingly beautiful displays over the Gulf of Mexico; I have seen them in the mountains and across long level stretches of flat country.

The real key to the sunrise-sunset situation seems to be this: be ready with a camera in the right setting when the spectacle occurs. The season and the exact spot on the map then become non-essential.

Bonanza

(*Continued from page 404*)

them perfectly on its glass-smooth surface.

Slinging his 400mm telephoto lens (mounted on a gun-stock) over his shoulder, Major started wading cautiously towards the birds. Using an old hunter's trick, he never faced them directly but angled from side to side as he steadily approached. A few nearby birds nervously flew off, displaying the wide black borders of their wings, but the main group remained. Back in the car, I eventually heard the snaps of the camera shutter, and knew my husband had at last captured our beautiful quarry on film.

As we hurriedly packed our bags, we reviewed our three-day stay on the Island of Flamingoes. Of the ninety recorded species, thirty-nine were residents, and we had seen them all! Our life list had grown by leaps and bounds. Our photos promised to be good, especially of the flamingoes that had allowed Major to come within fifty yards of them. We had seen the piquant little island from "stem to stern," and probably knew more about it than some of its own inhabitants. All in all, we decided it could not have been a finer three days, and, silently, we sent a grateful "thank you" to the airplane steward who loved to talk!

Mighty Flea

(*Continued from page 407*)

panions for as long as man has been on earth, it is natural that all sorts of cures for infestations have been recommended. Pliny, the Roman, advised collecting the dirt from beneath your right foot when you heard the first cuckoo's call in spring, and then sprinkling it in your bed and about your house. In England, you were told to keep your windows closed and your doorway swept on March first, the day fleas were supposed to return after winter. And there is a fable about the wise fox that backed into the water holding a bit of moss on his nose. When his fleas had all scurried to it to keep from drowning, the fox ducked under and let the moss drift away, carrying the fleas with it.

Today, fleas may be controlled. Tight floors in modern houses, powerful vacuum cleaners, easily washed bedding for pets—all have made it easier to prevent having a persistent flea problem. If such a problem arises, you have powerful, recommended insect killers, like DDT, chlordane, lindane, dieldrin, and others. But these poisons should be used carefully and according to directions, and do not be surprised if they fail. Fleas, like flies and other insect pests, quickly build up a resistance to many chemical killers, particularly when the same chemical is applied to successive generations.

To make certain the job is done right, you can always call for help from an experienced, bonded pest-control expert. Make sure you get one who uses more potent materials than the operator who was grilled by the lady who had called him to take care of a problem she was having with clothes moths. She wanted to know if his insecticide would harm her food, kill her plants, or ruin her furniture—so the badgered fellow blurted out, "Lady, what we're planning to do to your home won't even hurt a flea."

Patches

(*Continued from page 413*)

years ago. In shaking it to death, he grabbed the snake a little too far back of its head. It swung and struck him on the side of the jaw. Fortunately, it was not a large snake. Patches recovered without either losing his enmity for all snakes or dampening his courage in dealing terrier-fashion with them.

On several occasions letters have been sent to Patches by former visitors, addressed to him in care of the Hagars. His "life list" now is one any avid bird watcher might envy. After more than a dozen years of daily expeditions afield, he is always ready to go when Connie calls: "Come on, Little Man!" Without doubt he has seen more different species of birds than any other dog in America—and more different species of bird watchers, too!

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Nature IN ROCK AND MINERAL

By PAUL MASON TILDEN

Humble, But Important

AS I WAS WALKING DOWN THE STREET recently, two shiny new cars came together in one of those minor fender-crumpling incidents that are noisier and more expensive than dangerous. A sidewalk idler remarked that the crash "sounded pretty tinny" to him—inferring, of course, that anything made of tin necessarily would be "cheaply" built. Our sidewalk idler probably had not bought any tin on the metal market recently; if he had, he would have paid nearly a dollar a pound for his shining blue-white metal. As a matter of fact, tin is sometimes classed as one of the semi-precious metals, in spite of a world production that has been as high as 250,000 tons a year.

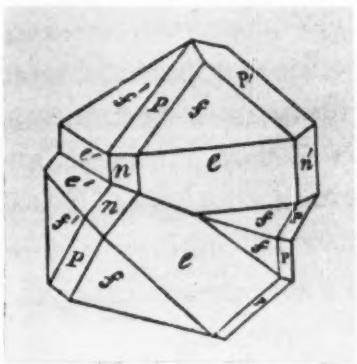
The United States consumes about forty percent of the output of the world's tin mines, and most of the metal goes into the ultra-thin plating of "tin" cans, and into bearing metals, brass, bronze, and other alloys. Tin is a vital component of the type-metal from which this page is printed, and a small amount also is used for foil, tubing, and chemicals. It has been said that most of the machinery of the world moves on tin.

From one mineral

All but a trifling amount of the yearly production of some quarter-million tons of metal comes from the mineral cassiterite, the simple oxide of tin. (Since a great number of minerals are named for their discoverers, it is easy to jump to the conclusion that this one honors someone by the name of Cassiter, but actually the word is from the Greek *kassiteros*, tin). With one important exception—the rich tin lodes of Bolivia—vein cassiterite, in economic quantities, is always associated with granite areas. The United States has many areas of granite, but when Nature distributed the world's supply of cassiterite, this country somehow was overlooked—a circumstance that has proved most profitable to mine and placer owners in the Malay States, the Netherlands Indies, Bolivia, and the Belgian Congo, chief producers.

Cassiterite, as it is found sparingly in many of the coarse pegmatite veins in the United States, usually occurs in small, black crystals that quite often, in strong light, seem to reflect a faint but distinctive shade of brown, especially on freshly broken surfaces. Considerable care must be exercised in acquiring matrix specimens of this mineral from the parent granite, as, although it is classed as one of the hard minerals (6 to 7 on the Moh scale), it is annoyingly brittle and quite easily shattered.

In direct contrast to vein cassiterite, the stream-bed tin oxide that results from the breakdown of tin-bearing rocks may be easily mistaken for small lumps of rusty iron, and is known as "stream tin." A pocket magnet will quickly eliminate the rusty iron possibility, however, as cassiterite is non-magnetic.



J. E. Teschemacher, mineralogist and crystallographer of the nineteenth century, sketched these cassiterite crystals from the first known lode tin deposit in the United States. From C. T. Jackson's "Final Report on the Geology of New Hampshire."

First lode discovery

The first discovery of vein tin in the United States is credited to Dr. Charles R. Jackson, State geologist of New Hampshire, in the early part of the nineteenth century. On Black Mountain, in the White Mountain town of Jackson, the State geologist discovered a number of veins that carried a considerable amount of both massive and well-crystallized cassiterite, along with a number of other minerals like wolframite, molybdenite, fluorite, native copper, and arsenical pyrites.

The news of Dr. Jackson's discovery made a considerable stir in the village, and Black Mountain was thoroughly searched for more veins, but the discovery location seemed to be perversely unique and the town soon dropped back into its ordinary routine. However, the old cassiterite discovery on Black Mountain still is a locality of interest to the collector, even if it failed to affect the price of tin on the commodity markets a hundred and twenty years ago! ⚘ ⚘ ⚘

The Compleat Catalog

We have never stood in any particular awe of superlatives like "super," "colossal," "gigantic," and so forth—have often suspected that their chief merit was to act as varnish for an inferior product. But we have been browsing through the 170-odd big pages of the *Encyclopedia and Super-Catalog of the Lapidary and Jewelry Arts*," published by Grieger's, Inc., of 1633 East Walnut Street, Pasadena, California, and feel that perhaps the word "super" is not badly used, after all. If there are items in the way of lapidary and jewelry supplies, gem stones, gem cutting equipment and tools that Grieger's has forgotten, we are at a loss to know what they might be. In addition to the items themselves, there is page after page of information on gem stones, rock determination, mineral structure, the phenomenon of fluorescence, the manufacture and characteristics of synthetic gem stones, and a world of other information to hold the attention of gemhound and rockhound alike. The *Encyclopedia*, in a paper cover, is $3.95, and in the deluxe bound edition, $4.95.

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What's What

(*Continued from page 436*)

be only 46 million miles away by October 31. Its magnitude will increase gradually from —1.2 on October 1 to —1.8 on October 31.

Jupiter, in Virgo, will set during evening twilight, about an hour after sunset on October 1, forty-five minutes after sunset on October 15, and at sunset by October 31.

Saturn, in Ophiuchus, will be located east of Antares. It will be low over the southwestern horizon at dark, setting at 9:30 p.m. on October 1, 8:30 p.m. on October 15, 7:30 p.m. on October 31.

The Orionid meteor shower is expected on October 20, although some meteors may be visible about five days on either side of that date.

A total eclipse of the sun will occur over the South Pacific Ocean on October 12. The path of totality will start at sunrise at a point almost on the equator, due north of the Solomon Islands.

Essay

(*Continued from page 416*)

him that a young man fresh from explorations in the forests of Malaya was about to present an almost identical theory to the Linnean Society of London. So on July 1, 1858, Charles Darwin and Alfred Russel Wallace jointly, but in separate articles, announced their conclusions. And now Darwin set to work in earnest, gathering up the major points of his years of study to build a solid foundation for his conclusions, which he published in book form the following year as the *Origin of Species*. In all the bitter conflict that followed, Darwin continued his studies, always eager to add to the scientific foundation of his work.

There is a curious postscript to this story. The history of science contains many instances of coincidence, but seldom do we discover coincidences that might have been. Darwin said nothing about the way in which variations arise, and this was a point that often was attacked. Apparently he never ran across the work of an Austrian monk who was at that time experimenting with garden peas, and applying his mathematical training—that Darwin so sadly lacked—to his results. If the modest report of this work had reached Darwin's eyes, it might have cleared up many points in his own mind, and perhaps softened the force of religious objections to his ideas. But the happy coincidence did not occur. Charles Darwin died, Gregor Mendel died, and genetics was left in the womb of the twentieth century.

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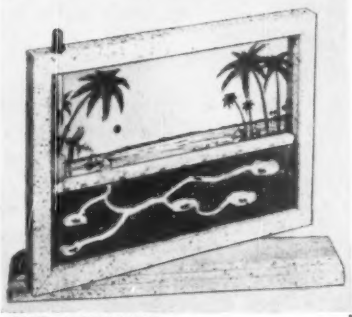

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Nature AND THE MICROSCOPE

By JULIAN D. CORRINGTON

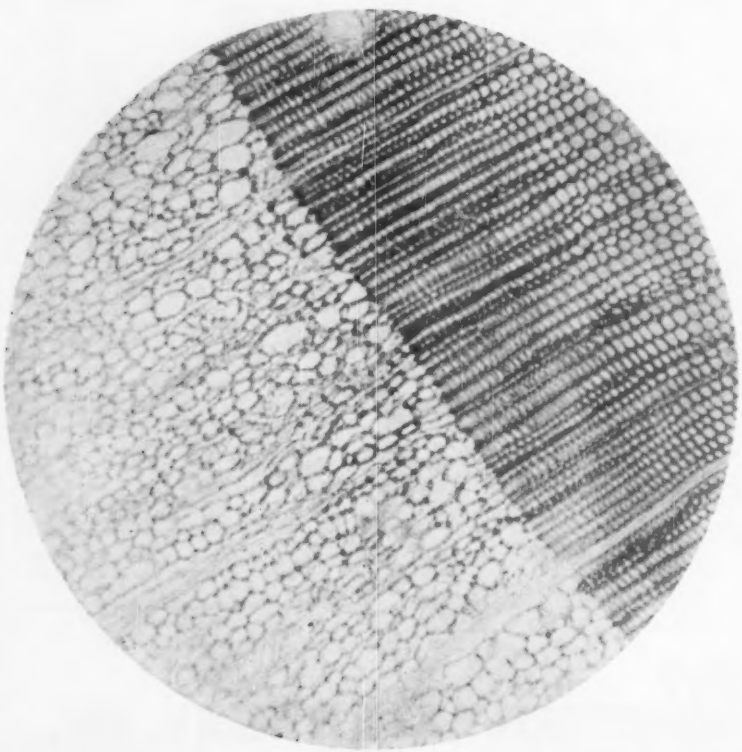
Drought and Pine Trees

By Bruce Hoffman
Charleston High School,
Charleston, Illinois

MY SCIENCE project, suggested by my teacher, Mr. Dawn Neil, was concerned with investigating the relationship between the growth of pine trees and drought.

The specimen trees were two jack pines and a white pine, which were taken from a seeded hillside south of Charleston, Illinois. From cross-sections of these trees, blocks were cut so that transverse slices or cross-sections of the trunk could be cut. These slices were cut on a microtome set at 30 microns, stained in safranin, and mounted in balsam. Photomicrographs were then taken of each slide. Assisting me in this was Alice Lefler, who has had previous experience in photomicrography.

An examination of the photos and slides thus prepared revealed a retardation of cellular activity during the 1954 annual growth, evidenced by a double false ring. U. S. Weather Bureau records showed that rainfall around Charleston was 12.13 inches below normal for the entire year. Correspondingly, 1954 was a small ring in the pine cross-sections. At the end of January, Charleston was already .43 inches below normal. Precipitation decreased steadily throughout July, with no previous months of the year having even normal rainfall. This was evidenced by an almost total cessation of cellular growth. August brought some relief, with rainfall .49 inches above normal, and the cells began more normal growth. However, September precipitation was 1.9 inches below average, and again cellular growth was impaired. October, with 1. 25 inches above normal rainfall, began the cell's growth once more. Although this growth was not up to normal, it lasted until time for an annual ring.



A normal annual ring. Notice the retarded growth of the fall (small cells), and the larger cell growth the next spring. Small circle at top is water tube.

Drought slows growth

It was concluded from the above evidence that a drought will affect a tree's cellular growth by a near cessation of cellular activity. It was found by Byram and Doolittle, in 1950, in their study of southern short-leaf pine, that growth was at a maximum when light, moisture and temperature were at an optimum; limiting effects may have been exerted by available nutrients, or by inherent characteristics of the trees, or on warm sunny days by a transpiration rate greater than the vertical transport of water, even with an excess of soil moisture. They continue that stored soil moisture decreased in June and from then until August soil moisture was a limiting factor on radial growth. Prolonged drought induced shrinkage of tissues, and "the length of time for recovery following a rain seems to be determined only by the time required for the water to reach the roots."

It was maintained by MacAloney, in 1944, that high temperature combined with moisture deficiency killed feeding roots of jack pine and brought on severe decadence. He concludes, "The death of the trees was very probably due, in the final analysis, to the drought in 1938 and 1939, which terminated 20 years of drought or near drought."

It was also observed in my project that the retarded growth of cells was more noticeable in the jack pines than in the white pine. The cause of this was not determined and is a subject for further investigation, but it can be speculated that either the characteristics of the two species or their relative locations on the hillside or a combination of these and other factors was the determinant.

Reference: Glock, Waldo S., Tree Growth II. Growth Rings and Climate. Bot. Rev., *21*, 1-3, 1955, pp. 88, 92.

Science Shops

13. Harry Ross

SINCE America is the land of opportunity, Americans are fond of reading success stories, especially

those in which one man starts from scratch and builds up an ever-increasing enterprise. In the area of Science Shops, such has been the career of Harry Ross, New York dealer in every sort of scientific equipment and apparatus for the hobbyist, the amateur, the student, and the professional, from scientific toys to microscopes and telescopes.

Many a college student has tried to become self-supporting while attending classes, and Ross is one who succeeded so well that his extra-curricular efforts soon determined his life career. While taking evening classes in electrical engineering at Brooklyn Polytechnic Institute, he sold prepared microscope slides by mail from his home. The first magazines to carry his ads were *Nature Magazine* and *Scientific American*.

The venture went off well, Ross added used microscopical equipment, and soon rented a store at 82 West Broadway, in downtown New York. It was a small place, and quickly outgrown, so he rented loft space in the building and elsewhere in the neighborhood to house his rapidly expanding line of merchandise. The business soon included retail, wholesale, and mail order, as is true today. Next, a line of chemicals and chemical apparatus was added.

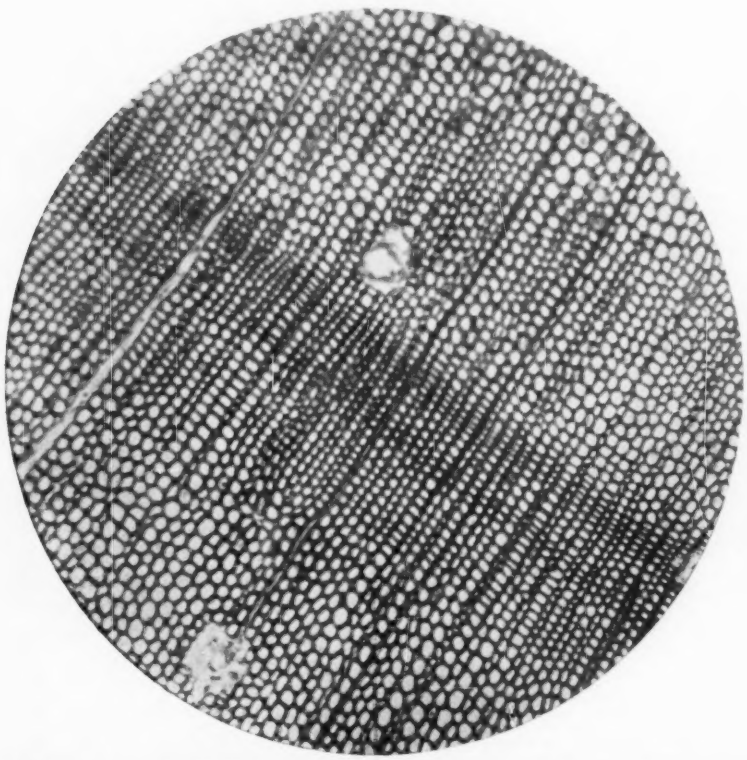
Ross moves again

After about five years, another move was made necessary by the fortunate purchase of several large estates as well as several business houses, so Harry Ross hung out his shingle on Warren Street. Just before World War II he moved to 70 West Broadway, and, in June, 1956, to 61 Reade Street, the present address, where he has some 3000 square feet of display area. This is an excellent location for the business, only a short block from City Hall Park, and within a block or two of every subway line in the city.

Ross was the first New York dealer to carry a full line of telescopes, parts, and astronomical supplies. He put in medical equipment, gem and mineral testing outfits, metallurgical and petrographic instruments, cameras, prism binoculars, research and testing equipment, scientific novelties and a whole host of other items as supplementary to the basic line of new and used microscopes and every form of accessory for the microscopist. He supplies students with science project items for various scholarship prizes, and finds this work highly rewarding personally.

In 1929, he joined the New York Microscopical Society, and in 1934 was made a Fellow of this famous organization, for which he served as recording secretary for five years. In 1954, he was made a Life Member. He is a consultant in microscopy and optics.

We frequently have occasion to refer readers to Harry Ross in matters of supplies, and he has always proved helpful. In our opinion, he is the top one-man organization in the country in the field of Science Shops.



The false ring of 1954, formed by the slowing of cellular activity in two different periods.

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"Can you use a camera lucida with a binocular microscope?" asks a correspondent. We replied in the affirmative, and, on looking

The E. Leitz camera lucida

through our file of recent photographs, came across this one from Leitz, which shows the situation perfectly.

The microscope is a widefield binocular, and has a camera lucida attached to the right eyepiece. The tilted drawing board includes support for the mirror. Together with the microscope lamp, the setup is excellent for tracing with pen or pencil the image seen when looking into the right eyepiece; the left one is not used. For left-handed people, the setup may be reversed. The New York office of E. Leitz, Inc., is at 468 Fourth Ave., New York 16, from which address any of these instruments or further information may be obtained.

Insect Eaters

There is a very good, brief summary on the characteristics and occurrences of the five types of insectivorous plants in *Carolina Tips* for January, 1958. This is the trade journal of the Carolina Biological Supply Co., Elon College, N. C., a state in which representatives of all of these groups are to be found.

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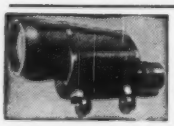

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The divine premed coed
Doesn't seem to pine
For the terms of the spine.
So the word "sclerotome"
Finds no home in her memory,
Her pretty dome
Dreams of romance alone.
If I tell her embolomery
Shows in the bowfin's tail,
She'll reply whoever invented
Such words ought to go to jail. . .
I whisper "basidorsal"
To this tempting Sophomore morsel,
She says "such mallarkey from
An otherwise normal male!"
I plead with this wren
To forget other men
And Blackstone the backbone with me.
But my aid she doth spurn
So I turn to my Neal and Rand
And learn those
Heterocoelous
Pleurocentrous
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Dog-goned vertebrae!

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By Earnest L. Lutz, Sr. Redlands, California, Route 2, Box 575. 1958. Natcol Laboratories. 106 pages. Illustrated. $3.50.

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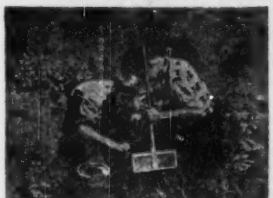

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